Issue 17 Autumn 2019

Abstract Games

...for the competitive thinker

Toguz Kumalak: A Central Asian Mind Sport

Ley Lines: New game by Eric Solomon

Katarenga design by David Parlett

Onyx: Tactical analysis

Hive opening theory

Tak: A review

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Much more!

New Series!

Front Cover

Zhadu was designed by Rodney Frederickson in 1995 and was first made available around 2000-2001. Rodney's second actually published game is Qyshinsu, although he has designed several other games. We reviewed Zhadu briefly in *AG11*, and we hope to cover his new game, Karvilaj, in the next issue.

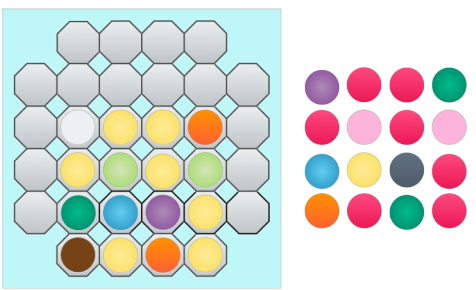
Zhadu is a small game, as each player has only five pieces, the 1-stone, 2-stone, 3-stone, 4-stone, and 1-2-3-stone. Pieces may occupy the corners or the centres of triangles on the board, and must move a number of spaces equal to their name designations. Capture is by replacement, as in Chess. A key feature of Zhadu, the source of its strategy and enduring interest, is its objective: you win when the first and last of the pieces you capture total four. Achieving the winning condition is called, remembering the Sharing. For example, an initial capture of the 4-stone is an immediate win, because it is simultaneously the first and last piece captured. On the other hand, capture of the 4-stone after capturing any other piece is not a win. The 1-2-3-stone is particularly important because it can combine with three other pieces for a win.

The second interesting feature of Zhadu is that the game is situated within a particular world, which is hinted at in the literature originally distributed by its designer. In this world, the play of the game has metaphorical significance. Zhadu is a game that I keep returning to over the years, and one of the charms of Zhadu is that it is so well suited to be the special game of an ancient culture. Even the effort needed to see move options in this game somehow seems appropriate: "Clarity comes with practice."

The use of a game as an anchor for world-building is interesting, and perhaps a reversal of the usual order. Jetan, for example, is a game of Mars, from the Martian series of Edgar Rice Burroughs, as covered in *AG6*, *AG7*, *AG8*, and *AG14*. Tak, reviewed in this issue, began as a fictional game in Patrick Rothfuss's fantasy world. Star Trek 3D Chess, discussed in *AG13*, is a science fiction icon.

Zhadu and Tak have no theme, and Jetan and Star Trek 3D Chess have wargame themes only to the extent that Chess also is a wargame. However, all four games are situated in particular fictional contexts—virtual themes. The games remain abstract, but they are games that belong to fictional worlds. The virtual theme of a game is irrelevant to the game itself, even as it may contribute to a game's charm. ~ KH.

Image: Zhadu in wild heather, Reigate Heath, England.



MeM puzzle solution.

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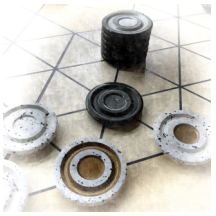

Late in 1999, we conceived the idea of creating a magazine about games. It was a different world back then. I had been playing abstract games *by correspondence* (yes, really!) with the kNights Of the Square Table (NOST) and by email through Richard's PBeM Server. The latter still exists, although NOST did not long survive the Internet era. There were no web-based options for game play. BoardGameGeek was still a baby, and was nothing like the colossus it has grown into. On a whim, *Abstract Games* came into being. The old *Games & Puzzles* magazine of the 1970's was an inspiration, and we hoped that *Abstract Games* would echo aspects of this classic game periodical.

Abstract Games ran for 16 print issues, from Spring 2000 to Winter 2003. The magazine was well received, and it is fair to say that it improved as time went on. However, we hit a wall in early 2004, when career and family commitments collided with time constraints. We ceased working on *Abstract Games* while producing *AG17*. The magazine has always felt to me like an unfinished project. Perhaps now is the time to start over.

The revived magazine is web published. As you can see, we are also preparing it for print, using the format of the original print magazine as a template, this time using more colour and photography. Hard copies of the revived magazine will be available through print on demand. All the original print magazine issues can be downloaded for personal use, and are freely available. Hard copies may still be purchased. Over time, we will shift the original print issues also to print on demand. The existence of the magazine as a physical artifact is important, for the new series as well as the old.

This new *Abstract Games* is a continuation of the first series, with the first new magazine called Issue 17 (*AG17*). We planned the structure of the web version *AG17* to embody electronically the key features of a magazine. We wanted to avoid a skeuomorphic flipping of pages or a disconnected list of articles, both of which are popular models for online magazines.

Still, the web publication begins with its version of the front cover, which leads into the table of contents. The articles are strung together, one after another. The flow of articles is similar to that of the original series. Our chosen electronic structure makes it relatively straightforward to translate the magazine to this physical form.

The content of *AG17* is a mix of old and new. When the old series ceased, we had much of the material for *AG17* ready to go. Although most of the material herein is new, we have revived some of the old content that was not published. In particular, I felt we should offer a little closure to the Shared Pieces Game Design Competition, which would have been rolled out in the old *AG17* and *AG18*. We even have new material on "old" games, like Onyx. Sometimes we used to investigate a game through a series of articles, and we plan to continue the practice of revisiting games covered in previous issues.

Our overall objective when writing about games is to give more depth of coverage than just the rules. Typically, our articles are aimed at people who are new or relatively new to a game, and who would appreciate some advice from an expert. Knowing a little bit more about how a game works can make it that much more enjoyable. We will also run interviews, reviews, and various other types of articles

As always, our focus is on abstract games, games without theme. Of course, there are very many more theme games than there are abstract games, and I would guess that in the last 20 years the balance has tipped even more convincingly towards theme games. Even many of the games on the BoardGameGeek abstract games ranking are themed, or at least it seems that way to me.

Nevertheless, the game mechanism in itself is always abstract, whether or not a game is themed. Most of the games we investigate will be genuinely abstract, but even theme games may have interesting mechanisms. The topic of abstract games, for us, means a focus on the mechanisms of games, whether or not these games are themed. As far as the abstract mechanism of a game is concerned, the theme does not matter.

I would like to offer heartfelt thanks to the collaborators and contributors who made the new magazine possible. *Abstract Games* is back up and running because people stepped up to help. A special thank you goes to my wife, Connie. We sometimes refer to "beautiful games" in these pages, but Connie is more beautiful than any of them!

Some of the contributors to the new magazine were with the old *Abstract Games*, back in the early 2000's, but others are new. I have not been able to connect with all the old friends. If you were involved in the original magazine, and I have not managed to contact you, please get in touch.

And so, welcome to the new *Abstract Games*! As we close this second decade of the twenty-first century, I hope there is still a place for our idiosyncratic game magazine.

Kerry

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(http://www.gamerz.net/pbmserv/)
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Published by C&K Publishing *(formerly Carpe Diem Publishing), P.O. Box 33005, West Vancouver, BC, Canada V7V 4W7*
Publishers: *Connie & Kerry Handscomb*
Editor: *Kerry Handscomb*
Creative Director*: Connie Handscomb*
Copy editor*: Don Kirkby*
Game testers*: Robert Best, Don Kirkby*
Photography*: Connie or Kerry Handscomb, unless otherwise indicated.*
Artwork & photo processing*: Connie Handscomb*
Game Fonts*: Alpine Fonts: https://www.partae.com/fonts/index.ph*

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Print ISSN: 1492-0492
Web ISSN:: 2562-9409

Website: http://www.abstractgames.org/
Email: newabstractgames@gmail.com

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Tak

A game in a world of its own

by Kerry Handscomb

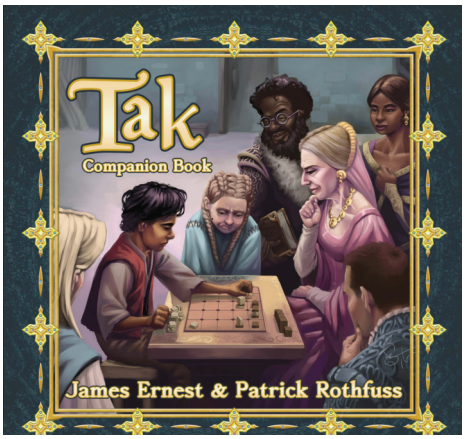
"Tak reflects the subtle turning of the world. It is a mirror we hold to life... The point is to play a beautiful game."
~ Bredon in The Wise Man's Fear.

On the inside front cover, we identified games like Jetan, Zhadu, Star Trek 3D Chess, and also Tak, as abstract games with a virtual theme, meaning that they are played in imaginary worlds. In the case of Tak, the world is the creation of Patrick Rothfuss. Tak is introduced in "A Beautiful Game," which is a chapter in Rothfuss's fantasy novel *The Wise Man's Fear*. Tak, in this world, is supposed to be a game like Chess or Go in our own, with thousands of years of development and deeply embedded in the culture of its world.

The very idea of a game with the same significance as Chess or Go, yet utterly unlike Chess or Go (or any other traditional game in our world) is immediately attractive. Does Tak genuinely have the depth, interest, and playability of Chess or Go?

Tak was designed by James Ernest, renowned author of dozens of games and founder of Cheapass Games. Of Ernest's creation, Rothfuss comments in the *Tak Companion Book*, "I was stunned. This game is everything I wanted. The rules are simple. The strategy is deep. It's more elegant than chess. It's more lively than go."

The *Tak Companion Book* is probably the first place to go if you are considering playing Tak. The *Companion Book* contains the rules of Tak, the story of its evolution in Rothfuss's world, and an evaluation of the cultural and social significance of Tak in this world. Great artwork by Nate Taylor helps to evoke the atmosphere of Rothfuss's books.



Tak Companion Book

According to the *Companion Book*, *"Tak is an ancient game, older than empires. For centuries, its simple rules and deep strategies have captured the hearts and minds of players throughout the Four Corners and doubtless into the barbarous lands beyond. It is not for nothing that famed strategist Peyramo Dolsn referred to Tak as 'King of games, and the game of Kings.'"*

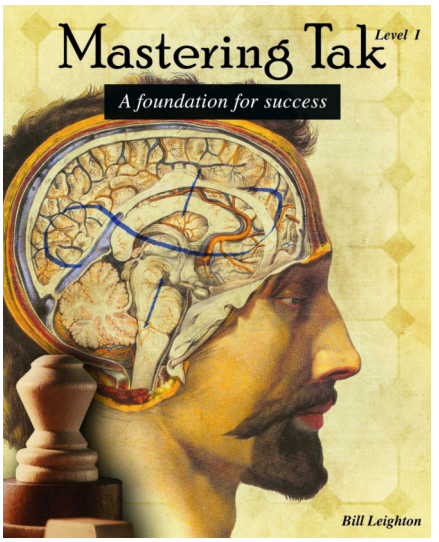
The rules of Tak are simple, which is a really good start. Tak can be played on squared boards of size 3x3, 4x4, 5x5, 6x6, or 8x8—presumably not 7x7 because of some numerology in Rothfuss' world. Each player has a collection of flat pieces that are thick enough to stand sideways as well as flat, and one special capstone piece, shaped a bit like a Chess bishop. Effectively, there are three kinds of pieces, flat stones, standing stones, and capstones. The flat pieces can stack and be distributed in a mancala-like way. The objective is to join any two opposite sides of the board with an orthogonally connected chain of your own flat stones, which is called a road. Your own capstone may form part of a road, but a standing stone may not. Standing stones can block, and they can only be flattened by capstones. The complete rules of Tak are given on the site of the US Tak Association (USTA).

In the manner that stacks are moved, Tak is reminiscent of mancala. Obviously, its goal is a connection goal, although both sides can aim to connect in parallel. Unlike, connection games like Hex or Onyx, Tak can be drawn, in that the whole board may be occupied by pieces, although neither player has a road. In these cases, the player with the most flat stones wins, so that the game also has a territorial component.

The appearance of Tak is very attractive, another very good point. I have the University Second Edition set, sold by Greater Than Games. It is a solid little game, although designed only for the 5x5 board—size 6x6 apparently is normal for competition games. Fortunately, it is easy to construct your own set, which is exactly what many Tak enthusiasts do. A fascinating aspect of the Tak culture is the construction of art sets, which players showcase on Reddit, YouTube, and elsewhere. In any case, Tak may be played without a board, imagining the squares, as in the image above.

I have played Tak a number of times, online at playtak.com against robots, and face-to-face with friends. I do not really know how complex and deep Tak is, and whether it can challenge Chess or even Go in this respect. Nevertheless, my sense is that Tak is certainly deep enough, with interesting and varied strategies. In addition, Tak seems to be exactly the kind of game that ought to be an intellectual pastime in some world, and James Ernest's creation is perfect in this respect. In terms of strategic interest, I would guess that Tak compares favourably with the best of the Gipf series of games, although Tak appears quite unlike anything Kris Burm would have come up with.

The potential interest of Tak strategically and tactically is suggested also by Bill Leighton's blog, Tak Thoughts, which is approaching 200 blog posts, many of which contain puzzles or discuss Tak strategy. Leighton has written a book, *Mastering Tak, Level 1: A foundation for success*. The book is filled with material on things like pattern recognition, board evaluation, winning threats, and sample games. For anyone picking up Tak for the first time, the Companion Book and Bill's blogs and book are excellent resources. For me, one of the great attractions of Tak is the existence of these resources for fuelling early study, which immediately make the game interesting. Bill Leighton told me there was a first player advantage in Tak of 59% for the 6x6 game and 66% for the 5x5 game. In tournaments, the players contest pairs of games, and strong players are investigating a handicapping mechanism, should one become necessary. Draws, according to Bill, are rare. Most games end with a player completing a road, although games ending with a full board and comparison of the numbers of flat stones are not uncommon.



Mastering Tak, Level 1: A Foundation for Success.

For competition, you may try playtak.com, or the US Tak Association lists several Tak clubs on its website, and organizes tournaments. Nevertheless, these resources are far apart, and in my several visits to playtak.com I have yet to find a human opponent. I would have expected more players online, given the existence of the US Tak Association, the books and other resources, and the excellent game itself. Another option for turn-based play is Discord, although I have yet to investigate.

According to Bill Leighton, most new Tak players are already fans of Patrick Rothfuss. Thus, the direction of transmission is from the fantasy books to the game, rather than vice versa. Perhaps here lies the problem, because the pool of serious new Tak players is thereby limited to the population of Rothfuss fans. To my mind, the game needs to be on one or more of the popular servers, with turn-based as well as real-time options, where it will be exposed to a larger number of potentially serious players. Tak is an excellent game, but no abstract game these days, no matter how brilliant, can take the world by storm. Tak should be competing for attention in the hurly-burly with other modern abstract games, at least in my opinion.

Nevertheless, the virtual theme of Tak is alluring. You do not even have to be a fan of the books. The very idea that Tak is the equivalent of Chess or Go in some other world is an attraction in itself. I highly recommend Tak, whether or not you have read or plan to read the books of Patrick Rothfuss. On its own terms, Tak is an original, beautiful game. ■

We gave James Ernest the opportunity to respond to the review, and he replied as follows, addressing just the topic of first-player advantage:

It's almost inevitable that a turn-based game with perfect knowledge will exhibit some advantage for either the first or second player. We expected this in the design, although we didn't have the player base to estimate it. (Obviously such games have a theoretical perfect solution in which one player always wins, but in the case of Tak we have only found one for the 3x3 board.)The game has a built-in balancing mechanism, however, in the form of a scoring system. The rules recommend that you should play an even number of games, alternating first player, and keep a total score for the session. Your score for winning is the size of the board (for example, 25 points for the 5x5 board) plus the number of pieces you didn't play. Many variations on this scoring system are given in the Companion Book *and other places. We felt that this type of scoring system was preferable to any additional in-game rules, since there really is no way to eliminate the advantage perfectly. I will also say that Tak is one of my proudest design accomplishments, and I'm thrilled that so many people are playing and enoying it.*

playtak.com: https://www.playtak.com
US Tak Association: https://ustak.org
Tak Thoughts: http://takthoughts.blogspot.com

The Way of Tori Shogi

Reviewed by
Kerry Handscomb

The Way of Tori Shogi is a book by Dave Brandl and Bill Croke, focusing on the 7x7 Shogi variant, Tori Shogi, in which the pieces are all named after birds. My PDF of the book is dated September, 2016, although a 2nd Edition (2018) is now available.

Tori Shogi was rediscovered and promoted by George Hodges in the 1970's. George was instrumental in bringing Shogi and its variants from Japan, and attempting to popularize them outside of Japan. The variants, possibly apart from Chu Shogi, were almost unknown to modern Japan, and George had to rely on archival material. I met George several times at Shogi tournaments in the UK in the early 1980's, and later in the 1990's when I visited his home to pick up copies of several of the larger Shogi variants. George was a strong advocate for Shogi. His legacy to the world of Shogi and Shogi variants is incalculable. In recent years, Tori Shogi has been played on Little Golem, and has attracted a small group of enthusiasts. Perhaps *The Way of Tori Shogi* will bring more players to the game.

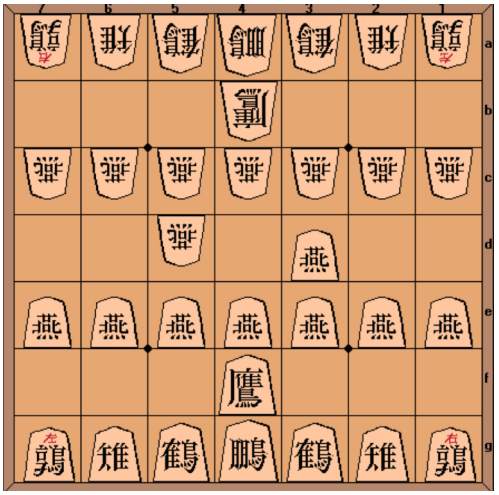
Throughout the first series of *Abstract Games*, Shogi variants were covered in almost every issue. We ran a series on the small variant Kyoto Shogi, and also discussed other small games, Poppy Shogi and Renge Shogi. Concerning the larger Shogi variants, we ran a series on Chu Shogi and interviewed Colin Adams about Tenjiku Shogi, games with board sizes of 12x12 and 16x16, respectively. It seems fitting to continue the tradition with a review of Brandl and Croke's book.

In any case, aside from Shogi itself, Chu Shogi and Tori Shogi are the only historical Shogi variants where actual games have come down to us. George Hodges put together much historical information on Chu in *The Middle Shogi Manual*, and Dave Brandl and Bill Croke have done something similar here for Tori Shogi—except of course that much less material is available for Tori than Chu. Moreover, *The Way of Tori Shogi* does not include all available historical material, more of which can be found on the Heterodox Chess website.

Tori Shogi is played on a 7x7 board with 32 pieces. The number of pieces is the same as Chess, with its 8x8 board. The Tori

Shogi board is thus crowded with pieces, and hostilities can begin from the first move, with immediate capture or threat to capture.

Tori Shogi uses "drops," like all the other smaller Shogi games, meaning that captured pieces can return to play on the side of the capturing player. Tori Shogi pieces, in keeping with the smaller board, are not as powerful overall as Shogi pieces. Aside from the Phoenix, which is Tori's equivalent of the Shogi King, none of the Tori Shogi pieces has a direct equivalent in Shogi. The Tori Shogi Swallow moves as a Shogi Pawn, although it promotes differently. Even then, however, a major variance between Shogi and Tori Shogi is that a player can have two of her Swallows on any given file—in Shogi, only one Pawn is allowed on a file. This distinction alone would give Tori Shogi quite a different feel to its larger cousin Shogi.



Tori Shogi setup, an image from the book

The layout of the book follows the outline of *The Book of Five Rings* by master swordsman and strategist, Miyamoto Musashi, of 17th century Japan. *The Book of Five Rings* is divided into five subsections, or books, each of which has a corresponding chapter in *The Way of Tori Shogi*.

The Earth Book

This chapter, which draws inspiration from 'The Earth Book' in *The Book of Five Rings*, contains a general discussion of strategy, alongside a history of Shogi and Tori Shogi.

Cho-Yo, Japanese artist, philosopher, and Shogi player, was the first person to introduce Shogi to the West (nearly 100 years before George Hodges!). The authors cite Cho-Yo as follows:

"This Japanese Chess, thus improved, is the most highly developed, most interesting and most scientific and philosophical of all the games ever invented and known. It plainly illustrates the secret intricacies and combinations and permutations of causes and effects of every human affair as a factor of nature. Playing this game cultivates business tact, keeps up strategy and tactics, improves diplomacy and strengthens the mental faculties."

Of course, these comments apply to Shogi, although I am sure the authors mean them to be applicable to Tori Shogi, too.

The authors discuss the strategy of Tori Shogi in the most general terms, putting particular emphasis on the importance of timing and the initiative.

The Water Book

'The Water Book' chapter contains the full rules of Tori Shogi. However, the authors go well beyond the rules, with a discussion of the tactics associated with each piece. For example, the writers say of the Falcon,

"Beware of the temptation to take easy Swallows early in the game, as this can lead to trouble. The Falcon, with no direct backward move, may become trapped and lost early, as with the Septic Swallow gambit, described in The Fire Book*."*

To my mind, any game with a "Septic Swallow gambit" deserves a closer look. The "Septic Swallow" example points to a particular line in the opening, but many other examples are not sourced from specific game situations. The reader needs to turn to the annotated games in 'The Fire Book' to see the principles of Tori Shogi played out.

The Fire Book

The core of the volume, and the longest chapter, is 'The Fire Book.' It contains a wide ranging discussion of strategy and tactics, including three closely annotated games. A strength of the book is the bringing together of these games, one from early nineteenth century Japan and two from modern tournaments involving strong players. The commentary is very clear, with enough diagrams to permit following through a game without having to set up the board.

Castles are a big part of Shogi strategy. The authors discuss castles in Tori Shogi, the first time I have seen anything like this. In particular, they include a sample game illustrating the Tori Shogi version of the Bear in the Hole Castle.The chapter finishes with a discussion of Musashi's 25 principles of strategy, and their application to Tori Shogi.

The Wind Book

'The Wind Book' chapter presents a number of other Chess-type games, including Chess, Shogi itself, Chu Shogi, Mini Shogi, Makruk, Xiangqi, and Changgi. They all have lessons for Tori Shogi—as does even Sumo, according to the authors.

The Void Book

'The Void Book' is Musashi's discussion of philosophy. Perhaps it has no direct connection with Tori Shogi, although the authors cite it quite extensively. In particular,

"You win battles with the timing in the Void born of the timing of cunning by knowing the enemies' timing, and thus using a timing which the enemy does not expect," and *"Enact strategy broadly, correctly and openly. Then you will come to think of things in a wide sense and, taking the void as the Way, you will see the Way as void. In the void is virtue, and no evil. Wisdom has existence, principle has existence, the Way has existence, spirit is nothingness."*

Is this sound advice for all players of abstract games and not just Tori enthusiasts?

The book finishes with appendices, with more information about the other Shogi variants, a list of Japanese phrases, and acknowledgements.

The use of *The Book of Five Rings* to structure a book on Tori Shogi seems quite appropriate. However, much of the contextual material in *The Way of Tori Shogi*, involving philosophy, other games, and so on, has nothing overtly to do with the game. I suppose the authors had to find some manner to float the sparse material resources because not a wealth of information is available about Tori Shogi. Nevertheless, as mentioned above, there are players and games on Little Golem, for example. Perhaps the authors could have mined these resources for one or two more annotated games and some problems.

On the other hand, situating Tori Shogi within Japan's world of the samurai provides Tori Shogi with a virtual theme. It anchors Tori Shogi to an era of legends, stories, and philosophies that have great emotive power. Perhaps this is not a bad way to attract new players. The authors have done an excellent job of bringing together available information on Tori Shogi, and they have highlighted the history and significance of Tori Shogi. Anyone with an interest in the Shogi variants should take a good look at this book, it is unique. ■

A PDF of *The Way of Tori Shogi* can be purchased for US$15 at http://www.torishogi.com.
Little Golem: http://www.littlegolem.net/jsp/main/

Adventures in Games Space

An interview with Cameron Browne

by Kerry Handscomb

Cameron Browne is an Associate Professor in the Game AI and Search Group at Maastricht University. Way back, in the early 2000's, he was a contributor to the first series of *Abstract Games*. He wrote articles on Hex Strategy for *AG2*, *AG3*, *AG4*, *AG8*, and *AG10*; Cameron and João Neto presented João's game Gonnect in *AG6*; then in *AG14* Cameron described his own game, the highly original 3D connection game Akron. Cameron has published the books *Hex Strategy* (2000), *Connection Games* (2005), *Evolutionary Game Design* (2011), and *Margo Basics* (2013). Cameron himself is a very prolific game designer with successful titles including Palago, Margo, Yavalath, the Shibumi game system, and many others.

In the interim, since the old series of *Abstract Games*, Dr. Cameron Browne has revolutionized game design theory. This is the topic that I wanted to ask him about, and he generously agreed to the following email interview, which was completed on September 25, 2019. I could not be effective asking technical questions, and instead, the questions lean a bit towards the mathematical. Below, my questions are italicized, with Cameron's answers in plain text.

The revolution began with the paper "Evolutionary Game Design. Computational Intelligence and AI in Games" by Cameron Browne and Frederic Maire in 2010. Cameron's PhD thesis on this topic followed, and then the book, *Evolutionary Game Design*.

The notion of *ludeme* is foundational. A ludeme is an element of a game, such as board size, board shape, or win condition. Games may be encoded as combinations of ludemes, or compound ludemes. The components of a game and its rules are together a single piece of information. The compound ludemes encoding games can be compared. The collection of games together with the relationships between them is a kind of "game design space" (or just, "game space"). Obviously, there are as yet many "undiscovered" games in this theoretical game space. Cameron devised a way to search for new games by combining the ludemes of existing games. Some human judgement was used in the evaluation of the quality of the new games. Nevertheless, the games themselves resulted from the systematic manipulation of compound ludemes. The process turned up some striking games, including Yavalath. And so, to begin the interview:

Do the known games constitute a large portion of the possible game space?

I'd say that known games constitute a relatively small and sparsely distributed portion of the potential game design space. But if you also consider the unknown games—all the ideas that thousands of designers have tried over the years which didn't work, and are discarded, or have led to something better— then that's a much greater coverage. A lot of my research has been aimed at navigating this space effectively to find the good bits amidst all the noise.

Could there be whole genres of games waiting to be discovered?

Absolutely! You mentioned the automated discovery of Yavalath, a game with a simple but novel end rule: win with 4-in-a-row but lose with 3-in-a-row beforehand. This apparently self-contradictory mechanism proved to possess some interesting emergent properties and has already inspired several other "N but not N-1" games that use this concept in different ways. I'd hesitate to call this a new genre of games, but it shows that there are interesting new mechanisms out there waiting to be found, and that it's not actually that hard to find them.

You state in the "Evolutionary Game Design" article, "The absence of flaws is a pre-condition for beauty," speaking of games. That's an interesting statement. Are you able to elaborate a little?

If you think about other forms of art, then that statement is nonsense. It can be the uneven glaze on a pot, the crack in a sculpture, the discordant note in a piece of music, the uneasy juxtaposition of colours in a painting that make it beautiful. But games are an unusual art form; their rules are precise and finely balanced, and any flaw can ruin the players' experience of the game and detract from its value. Designers spend a lot of time fine tuning their rule sets to remove perceived flaws.

The ko rule in Go is a case in point. The potential for infinite cycles of capture and recapture was a crippling problem in an otherwise beautiful rule set. But the introduction of the ko and superko rules—that simply forbid such cycles—not only solved the problem but introduced a whole new swathe of strategies, and there are now books on the topic. Removing this flaw turned a bug into a feature.

I*s there the possibility of genuinely novel games using completely original ludemes?*

I believe that there is definitely the possibility of genuinely novel games, but that these will probably be composed of known ludemes. The simplest ludemes represent fundamental mathematical truths—sizes, distances, logical, algebraic, or geometric relationships—and there are only a finite number of these. Humans have been inventing games for thousands of years, and fundamental rules that someone has not already thought of at some point will be few and far between. It is in the combination of these fundamental rules and the emergent behaviour that results where the novelty will come.

Do you think aliens might play games, using ludemes we could never understand or appreciate?

All humans play games, so I don't see why not. Games play a crucial role in how we learn about the world and how to interact with others. But the alien forms, thoughts, needs, values, etc., might be so different to ours that ludemes they find meaningful we would not recognise as such.

Turning to another form of non-human intelligence, some colleagues recently studied the question of what types of games computers might play if they become superintelligent, both among themselves and with their human users. Their conclusion was that we had better hope that they do not take a liking to "domination" games, and that we should probably instil some morality checks and ethical guidelines before this happens (see "Playing Games Across the Superintelligence Divide").

You finish the paper in the following way: "Finally, we hope that game designers do not see in systems such as Ludi a threat to this very human endeavour. Designers can benefit tremendously from such tools and will—for the foreseeable future—hold the edge in unconstrained creativity." How long is the foreseeable future?

That's hard to say. It depends on a number of factors including the degree of research interest in this question and who is interested in it. Google DeepMind recently changed the landscape of my research field—Game AI—when they announced the staggering success of their AlphaGo and AlphaZero projects. AlphaZero learnt to play the complex games of Go, Chess, and Shogi to superhuman levels within hours, through self-play alone, with no use of human game databases or expert knowledge. Wow. This work pretty much ended the active field of Computer Go research overnight. But I'm not sure how many people appreciate the amount of computation that went into these results; in the order of one million times the computing power of a standard consumer machine.

If a team with pockets this deep, machines this powerful, and programmers this good turned to the question of automated game design, we could see huge advances very quickly. But luckily they are distracted by other problems such as understanding intelligence, improving medical technology, and curing cancer. And human designers will always have the edge in knowing what human players are really looking for in games.

Engines such as Alpha Go or Leela Chess Zero are bringing new understandings of deep strategies in these games. Would tools such as these enable a more accurate or deeper evaluation of new-game quality?

They would certainly allow deeper analyses. For example, they may give a more reliable indicator of potential strategic depth as such engines implicitly capture more complex and subtle strategies than previous approaches have (even if they cannot explain those strategies without the help of a human expert interpreter). They have even captured novel and superior strategies that humans have not considered—or at least not appreciated fully—although again it takes a human expert to interpret these in order to make use of them.

But it is not so clear whether these state-of-the-art engines give more reliable measures of new game quality. It depends what type of quality we are looking for. If it is the ability to win as often and as quickly as possible, then yes these engines will beat any human player. But if we are looking for whether humans will enjoy playing this new game, then superhuman play will provide a biased perspective on the game that does not necessarily reflect the experience of the average human player. Chess and Checkers matches played at the world championship level tend to end in draw after draw, but this is not my experience of these games when playing them—at a much humbler level—with my friends and family. In order to reliably measure games for their potential to interest human players, I believe that we actually need to scale back the AI in some cases to give average "human level" play.

In 2015 you launched the Game & Puzzle Design Journal*, which ran for six issues, until 2017. As I understand it, this magazine was effectively the journal of game design theory—an academic journal. Hopefully, the hiatus is only temporary. Would you consider restarting the journal when the community of game design theorists grows large enough?*

Certainly. I deliberately went with a print-on-demand model to avoid deadlines and dependencies on external publishers. The template for the next issue is there and ready to go, if I ever get enough submissions and find enough time. But I can't see this happening until at least the end of my current project.

What were the goals of the magazine?

The practical goals of the magazine were to provide a venue for game designers and researchers to publish work that might not otherwise be seen, and to collate a range of ideas on the design of a range of games and puzzles from a range of different perspectives. The rather ambitious scientific goal of the magazine was to formalise the art of game and puzzle design into more of a science, and to explore the similarities and differences between game and puzzle design.

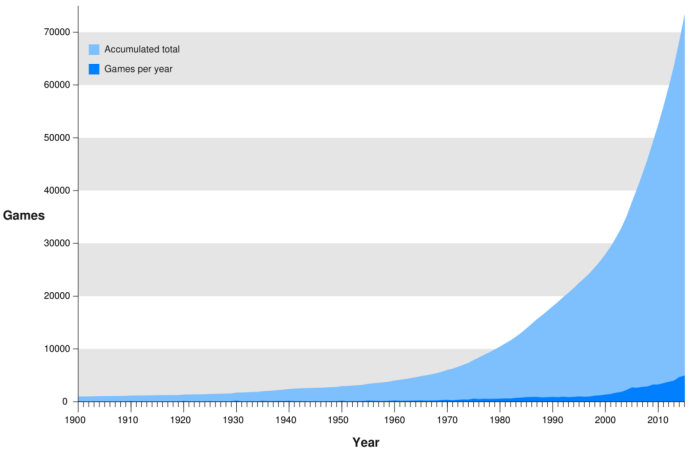
Unfortunately, *Game & Puzzle Design* suffered from something of an identity crisis; some accomplished designers were put off by the academic format required for publication, while academics familiar with the format did not seem inclined to engage with the more speculative "human" aspects of design. However, I believe *G&PD* served a purpose as an outlet for authors while *Abstract Games* magazine was on hold, so it's very timely to see *AG* become active again now that *G&PD* is taking a break.

Are there many new people entering the field?

In terms of game design, there are more designers and more games being designed than ever before. A few years ago I made the attached graph showing the total number of known board games per year for the last century, based on data from the BoardGameGeek database. There are two inflection points—a spurt of new designs in the 1970's then again around 2000 with the widespread uptake of the internet—but otherwise this is an exponential curve not dissimilar to a curve showing global population over the same period. There is no indication of this trend slowing down.

But in terms of research into game design, there has sadly been a steady decrease in board game research over the last decades. This may be due to key milestones such as Chess, Go, etc. dropping one by one, and an obvious shift to video game design especially by younger researchers.

Your latest initiative is the Digital Ludeme Project. It is another application of the idea of ludeme, the way of encoding games as information. Of course, all traditional games belong to game design space. Interestingly, the relationships between games in



game design space allow some conclusions to be made. For example, lost games can be reconstructed or the history of a game's development can be deduced. Systematic investigations of historical games in this way is another entirely new academic area, Digital Archeoludology. How would you characterize the significance of Digital Archeoludology?

While there exists a wealth of archeological evidence of ancient games, the rule sets for these are rarely found and we actually know very little about how these games were played. Our understanding of them is based largely on modern historians' reconstructions, and while these may be plausible they tend to emphasise historical authenticity rather than mathematical analysis of how the resulting rule sets actually play as games. Many reconstructions have proved to have serious flaws that make them unlikely to have been the way those games were actually played. Conversely, computational studies of games tend to focus on mathematical aspects without regard for the historical and cultural contexts within which those games were played. Digital Archeoludology is an attempt to bridge the gap between traditional and computational studies of games, to use modern AI techniques to help improve our understanding of ancient games.

The website contains a growing number of compound ludemes of games, encoded in Ludii. To you envision the library expanding to contain all abstract games?

Not really; it is theoretically possible but would be a huge undertaking. A key aim in the Digital Ludeme Project is to model the 1,000 most important *traditional strategy games* (i.e., mostly abstract board games plus some other types) in Ludii, but we also plan eventually to include at least as many modern games.

Simply estimating the number of distinct abstract games is a challenge. There are thousands of known Chess variants… more than a thousand known Mancala variants… and this of course depends on the exact definition used for inclusion. But something in the order of 10,000 seems reasonable.

People can download and use Ludii to play traditional games and test new games. I think Stephen Tavener's Ai Ai accomplishes something similar. How do you compare the two systems?

The two systems satisfy different needs. Ludii has been designed specifically for the task of game design. Its main purposes are to model as wide a range of games as possible as easily as possible, and to allow automated analyses and comparisons between different types of games that have not been possible before. The AI agents that we provide with Ludii aim to play each game at a competent level, at least as good as an intelligent human beginner, and there is no desire to achieve superhuman playing strength. We want to measure the "human" experience of each candidate rule set, rather than a superhuman perspective and all the biases that entails.

Ai Ai, on the other hand, has been designed more as an automated play tester and challenging AI opponent. While it does allow some customisation of games, each new addition typically has to be programmed by an expert user. But Ai Ai comes into its own when analysing games, as it provides a range of AI opponents and automatically selects which to use for each given game. And Stephen is a world class programmer who specialises in optimisation, so Ai Ai's performance is second to none. For example, his implementation of Connect4 achieves 1,500,000 playouts per second on a single thread of a standard laptop, which is just ridiculous. It is quite rude of Stephen to show up the rest of us game programmers like that.

We are living in a golden age of new abstract games. So many are being developed, of high quality—measurably high quality! I suspect the number of players of abstract games has not grown nearly as much, which means there are fewer players playing each game. Do you see this as a problem?

That's an interesting question which I'd never considered. Of course, choice is good—the more games the better!—but there is the issue of finding the games that you'll actually enjoy playing amidst the exponential proliferation of new options. Ludii could possibly help here. It should be possible to not only suggest to players games from its database they are likely to enjoy based on their previous play history, but to automatically generate bespoke games for individuals customised to include preferred mechanisms or display desired behaviours.

Do you think it's still possible for a new game to emerge from the crowd that has enduring mass appeal?

Yes I do, but I doubt that anyone can accurately predict exactly what type of game that will be. I recently played one of the currently bestselling "strategy board games" with a well-meaning group a generation younger than myself. They had great fun for the next two hours while I found very little to latch onto and spent the time mostly just perplexed: What exactly are they enjoying about this? Where is the game? Where is my beer? Can I go home soon?

Mass appeal is an elusive and changeable thing, and subject to the demands of a younger player base that has grown up on a diet of increasingly complex games. My inclination is always towards simpler games in which depth emerges from the natural interplay of equipment and rules rather than the sheer amount of information to be processed and decisions to be made. So while a new game may emerge that has enduring mass appeal for the current cohort of players, perhaps we can't read too much into what future generations will make of it.

(Continued on p.42.)

Goals in Abstract Games

Proposing a new classification

by David Ploog

The most important aspect of any human activity is arguably its goal; words of wisdom about journeys and rewards notwithstanding. Among sports, for example, a boxing fight, a bicycle race or a badminton match have entirely different objectives and thus purposes. Among board games, the standard treatises classify goals according to human conflict and competition, both violent and peaceful. As Harold Murray put it, "Games are typical of the early activities and occupations of man—the battle, the siege or hunt, the race, alignment, arrangement, and counting." His system allows more than two players and chance elements but is restricted to traditional games. David Parlett's book is half a century younger, and does include modern, designers' games. However, his classification intentionally follows Murray's lead, except for changes in terminology and additions necessitated by newer games. Here is a table compiling the systems by various authors, where two further categories from Richard Bell's book are omitted (Dice Games and Domino Games).

Murray (1952)	Bell (1960)	Parlett (1999)
Race games	Race games	Race games
War games	War games	War games
Hunt games	-	Chase games
Alignment games	Games of position	Space games
Mancala games	Mancala games	-

All three authors agree on Race Games, played with dice on linear boards, such as Ludo or Backgammon. Parlett's Displace Games are about capturing all opposing pieces (Fanorona, Draughts) or a particular piece (Chess). There is immediately an inconsistency regarding Go: For Bell, it makes up the subcategory Territorial Possession of Games of Position. Similarly, for Parlett it sits in the category Occupation of Space Games. By contrast, Murray follows theme and classifies Go as a War Game. For abstract games, Parlett's Space Games contain many interesting win conditions, and he further subdivides them into seven cases, as shown opposite.

I believe that confusion is inevitable once theme, material, and goal are mixed up. Restricting to games for two players and disregarding elements of chance such as dice and dominoes I suggest an entirely different approach, focusing solely on the win conditions.

★★★

Alignment	Form a line of specified length	Gomoku, Nine Men's Morris
Connection	Link opposite borders	Hex, Twixt
Traversal	Get all pieces into one's house	Kono, Halms
Attainment	Get one piece across the board	Quandary, Epaminondas
Configuration	Arrange all pieces in a special pattern	Agon, Shoulder to Shoulder
Restriction	Opponent cannot move	Do-Guti, Pentominoes
Occupation	Gain the largest territory	Go, Reversi

The most basic distinction among win conditions for (abstract) board games is this:

- Is the winner determined by a *score?*
- Is the winner determined by a particular *board position*?

These questions are not mutually exclusive. A particular ruleset can employ both modes: during an ongoing game, either player may win or lose from a certain board position; otherwise, the end condition triggers, and scores are tallied and compared to settle the winner—one common instance is a point-scoring game with the additional rule that stalemate equals loss.

Before going into the various types of win conditions, a word of warning. For several reasons, there will inevitably be games avoiding any scheme, avoiding in particular my scheme. The first reason is that a game may use different goals for the two sides; this happens in Tablut which is an elimination game for Black (hunt the White King) but a crossing game for White (win by moving the White King to the boundary). Secondly, a game may simply combine win conditions of various kinds. For example, Arimaa is won by either getting a rabbit on the opponent's home row (crossing goal), by capturing all opposing rabbits (elimination goal), or by immobilizing the opponent entirely (stalemate goal). Thirdly, a new design could carry a win condition never seen before and thus missing from the classification. Finally, the 'real' goal of a game may differ from what the rules say. This is a very interesting issue and clearly prone to personal opinions. I will dwell a bit on it when discussing Amazons and Ayu.

Win by higher score

The variety of scoring systems among board games is huge. For example, the rules of many hobby games tediously start with, "... the goal of the game is to accumulate most victory points." In this article, I restrict the discussion to abstract games and, luckily, there are almost no elaborate and contrived victory point systems to be found here. Instead, scores can generally be established from the final board position or the number of captives, in other words, naturally. I believe that this is an attractive and desirable form of clarity. Before going into these games, let me address a few general points about scoring games.

Most importantly, every game with scoring needs to contain an *end condition* alongside its win condition. Often, a game ends with one of the following conditions: agreement; full board; fixed number of turns played; stalemate. Some games allow the player to prolong or shorten a match intentionally, and I mention Ponte Del Diavolo and Buku in this regard.

Moreover, scores provide a neat way to equalize differences in skill. The weaker player can get a previously agreed upon number of extra points. Similarly, the starting player advantage can be compensated by giving a fixed number of points to the second-moving player. This is called *komi* in Go.

Captive-scoring: The winner has captured more pieces.

Games of the Mancala family (also called sowing games) are of this kind, such as Awale, Kalaha, Toguz Kumalak (see page 35), or Bao *[AG4, AG5]*. A chessboard specimen, keeping the Mancala tradition of a single colour, is Buku (Jorge Gomez Arrausi, 2001). And while the precise rules of Alquerque have not been passed down to us, it is generally assumed that the winner of this Checkers forerunner is the player who has captured more pieces. A recent game of this kind is Harvest (Brian Wittman, 2012).

Territory-scoring: At game end, surrounded territories are compared.

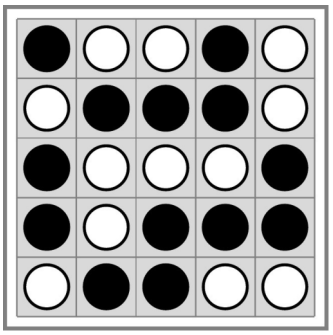
Also called "area-scoring games" or "games of enclosing". The prototype is Go; in this text ideally with Chinese scoring, making for simpler and more streamlined rules.

A minor classic in this category is Amazons (Walter Zamkauskas, 1988) *[AG16]*. It is interesting to observe that Go is a placement game with capture whereas Amazons is a movement game without capture. Also, the rules of Amazons say that a game is lost by being unable to move (i.e., stalemated). The rules are an elegant way to phrase the goal, but I am sure that it is better to think of Amazons as a territory-scoring game.

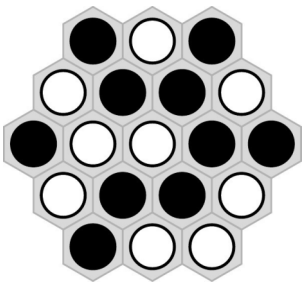
Other good territory scoring-games are Anchor (Steven Myers, 2000) [*AG5*], Dispatch (Chris Dissemble & João Pedro Neto, 2002), Ponte Del Diavolo (Martin Ebel, 2011)and Storisende (Christian Freeling, 2018).

Chain-scoring: A player's score is determined by the list of that player's chain sizes.

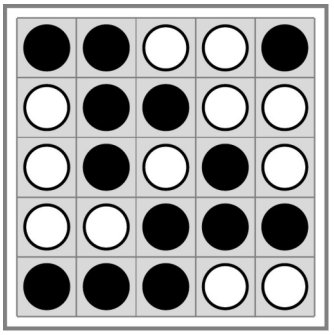
This may sound complicated but it is a very precise definition. First, a chain is a maximal set of connected pieces of the same colour. This concept is ubiquitous among board games; other terms are "clump" (Lines of Action) [*AG1*] or "group" or "cluster" or "component". At the end of a game, there will be a collection of chains of each colour. A game belongs in this category if a player's score can be read from the list of chain sizes. Here are some examples of full-board positions and the resulting chain sizes:



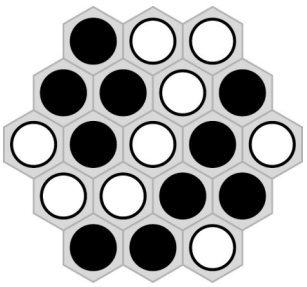
White: 5, 4, 2, 1; Black: 7, 5, 1



White: 7, 1, 1; Black: 6, 4.



White: 4, 3, 1, 1; Black: 9, 1,



White: 4,2,2,2,,1,1; Black: 6,4,2.

The typical end condition for chain-scoring games is filling up the board. Many, but not all, such games use pure placement. The simplest type of chain-scoring is to count all stones of each colour. This happens in Reversi (John W. Mollett & Lewis Waterman, 1883), now better known as Othello (Goro Hasegawa, 1971) [*AG9*] or the arcade-born Attax (David Crummack & Craig Galley, 1990). I give this category so much space because it has exploded in recent years. The table on the following page lists some examples, sorted roughly from local to global scoring. In each case, assume that the game ends with a collection of chains of one colour, sorted by descending size. Note that that the sum of the sizes of all chains of a given colour is just another way of saying the total number of pieces of that colour.

For example, Minimize is won by having the smallest chain on the board; Xodd or Yodd are won by having the smaller number of chains; Omega is won by achieving the larger product of all chain sizes. For Symple, the parameter P is a previously fixed penalty attached to each chain.

A natural extension of this category are games where not all chains are admitted for scoring. Examples are Star (Craige Schensted, 1983) and Polar (Dieter Stein, 2006).

Other scoring rules.

Familiar from hobby games, majority scoring has been employed also for abstract games. Kulami (Andreas Kuhnekath, 2011) is a popular game about majority-scoring of tiles; Tintas (Dieter Stein, 2016) is about scoring the majority among seven colours.

Scoring possibilities are nowhere exhausted: Olix (Reiner Knizia, 1994) uses scores for four patterns; in Boom & Zoom (Ty Bomba, 2012), pieces crossing the board yield scores, and three points enable a win; in the classicMeM, also called Imago (Anatol Holt, 1968) [*AG2*], players score by shape-colour matching.

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Formula and comparison		Example games
l_n	min	Minimize (Brian Wittman (2014)
l_1	min	Puddles (alp Lo, ???)
l_1	max	Catchup (Nick Bentley, 2010), Ecalper (Matteo Perlini, 2010)
$l_1 l_2$	max	Producto (Nick Bentley, João Pedro Neto & Bill Taylor, 2013)
$l_1+l_2+l_3$	max	Taiji (Néstor Romeral Andrés, 2007)
$l_1^2+l_2^2+l_3^2$	max	Tonga (Grupe del los Lunes, 2004)
n	min	Xodd, Yodd (Luis Bolaños Mures, 2011)
$l_1+...+l_n$	max	Reversi, Othello, Attax
$l_1...l_n$	max	Omega (Néstor Romeral Andrés, 2010)
$l_1+...+l_n$ - nP	max	Symple (Christian Freeling & Benedikt Rosenau, 2010)

Win by board position

For the majority of abstract board games, the win is established by a particular board position rather than by a score. Time-honoured examples are the checkmate, capturing all pieces in Checkers, or forming a winning link in Hex. There is a lot of leeway for such binary—pass or fail—win conditions. Note that here we are talking about games which are ended and won *instantly*.

While not logically required, all positional goals known to me refer to pieces of only one colour. My proposal is to distinguish win conditions by cardinality and colour: Is the rule phrased in terms of all pieces, some pieces, or one piece? And of which side? A secondary distinction is whether the goal makes use of distinguished zones on the board. The following presentation roughly follows history.

Elimination: all opposing pieces are captured.

As mentioned above, these are sometimes called "war games". Classical examples are the whole ancient Merels family, for example, Nine Men's Morris [*AG13*]. These games are won if the opponent is reduced to two pieces, thus unable to capture. Other old elimination games are Checkers and Fanorona. It speaks to Murray's assessment of board game evolution that so many traditional games are war-like.

Devising a good elimination game is very hard because minor material superiority may be insufficient to force a win. This is why Checkers and Fanorona have strong rules about compulsory capture. A good modern elimination game is Oust (Mark Steere, 2007) which unusually in this class is a placement game starting from an empty board.

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Mate: one (particular) opposing piece is captured.

This category is dominated by Chess and its variants. Hunting the king is a primal goal, often generating strategies, drama, and stories at the same time. The traditional Nordic game Tablut [*AG16*] has this win condition for one side. A new game of this type is Cannon (David E. Whitcher, 2003).

Traversal: All one's pieces are in a designated goal area.

Other names might be "migration game" or "complete crossing game", the latter to distinguish from single-piece crossing games described below. The concept of moving one's pieces into the 'house' stems from ancient racing games such as Parchesi or Nard, the precursors of Ludo and Backgammon. Another traditional example is the Korean Five-field Kono.

The prototype of modern traversal games is Halma (George Howard Monks, 1884). Its later conversion to the triangle-grid Chinese Checkers (originally German Stern-Halma, 1893) is better known and has become a folk game. However, much older is Agon (inventor unknown, before 1800). Agon has the peculiar property that both sides have the same goal zone on the board! Another, similarly old, game with a related goal is Conspirateurs where the goal is to get all one's pieces into safety which, however, is off-board instead of a goal zone on the board.

There are few traversal games. A reason for the scarcity might be the inherent lack of direct interaction: these games cannot feature permanent capture.

Pattern games: Some own pieces form a specified pattern.

This category includes the traditional Gomoku, the Japanese five-in-a-row game, and its derivatives Renju and Connect 6 (I-Chen Wu, 2006). These are also called "alignment games". The variants Ninuki Renju and Pente (Tom Braunlich & Gary Gabrel, 1977) [*AG12*] are not of this type because their goal is to achieve either a line of five or to capture ten pieces. Other popular alignment games are Connect 4 (Howard Wexler & Ned Strongin, 1974) and Yavalath (Cameron Brown's rule-generating program Ludi, 2007). All of these games are of the placement type. An alignment game with movement is Hasami Shogi.

There are a number of games with winning pattern other than just lines. Among them are Hexade (Christian Freeling, 1982) where players compete to form either a triangle, a ring or a line of six stones. SanQi (L. Lynn Smith, 2003) has the same winning patterns as Hexade, but players share pieces and have unequal goals. Manalath (Dieter Stein, 2012) has the 22 hexagonal pentominoes as winning patterns. Some games use squares, among them Quartetto (Artyom Tchebotarov, 2004) and Morelli (Richard Moxham, 2011). The latter has a delayed goal because the last square pattern will win, not the first.

The patterns should be either from a short list or have a simple description. Orientation and position do not matter. Pattern games are tactical rather than strategic. It is also reasonably easy to produce a working game, and hence there is a plethora of them.

Connection games: A chain touches all specified zones

The idea of linking borders seems totally natural but was only first implemented in the well-known Hex (Piet Hein, 1942) [*AG2*]. See Cameron Browne's book for a history of the genre, including a few obscure precursors. Connection games prove to be popular and easy to design and consequently there is now a huge number of

them. Hex is played on a four-sided board of hexagons and one player has to link top-bottom, with the other player to link left-right. As Hex is a pure placement game, draws are impossible, and one player will necessarily win.

The Game of Y (Craige Schensted & Charles Titus, 1953) employs a symmetric win condition: a winning connection will link three non-adjacent borders of a six-sided hex board. Unlur (Jorge Gomez Arrausi, 2002) [*AG12*] is an asymmetric connection game where all balancing lies in the initial placement phase.

Some connection games use more complicated basic links than adjacency. Among them is Twixt (Alex Randolph, 1962 [*AG2*] with knight jump links, and Network (Sid Sackson, 1969), using line of sight. A connection game with placement and movement is Slither (Corey Clark, 2010). A currently popular connection game is Tak (James Earnest & Patrick Rothfuss, 2017). A connection game played on an unusual board is Onyx.

Unification games: all pieces of the player form a single chain.

Other good names for this class are: "conglomeration"; "convergence" (Browne); "congregation" (Parlett). The definite origin of this category is Lines of Action (Claude Soucie, around 1962) which has become a minor classic.

There are not terribly many such games. Here are a few others I could round up: Shoulder to Shoulder (David Parlett, 1975), Groups (Richard Hutnik, 1998), Volo (Dieter Stein, 2010), Ayu (Luis Bolaños Mures, 2011) and Make Muster (Dale Walton, 2019).

In his book on co. They play differently and have different formal properties: connection is about some pieces linking certain zones; unification is about all pieces and there are no distinguished zones.

Crossing games: one own piece reaches the designated goal zone.

This is called "attainment" by Parlett. In the examples I am aware of, the goal is to march across the board, usually to the other side; sometimes into a corner. A very typical and pure crossing game is Breakthrough (Dan Troyka, 2nnection games, Cameron Browne considers unification as a subset of connection. I think it is worthwhile to separate them000) [*AG7*]. It can be crudely compared to a game of pawns-only Chess where a player wins by reaching the opponent's home row. The asymmetric Tafl games, such as Tablut [*AG16*], have a crossing goal for the weaker side which has to get its king to the safety of the border.

George S. Parker invented two early crossing games, Chivalry (1887), later simplified to Camelot (1930) [*AG7*]. These games slightly extend the definition because a win is achieved by getting two pieces into the (two-tile) goal zone.

A modern classic is Epaminondas (Robert Abott, 1975) [*AG3*], famous for its phalanx movement and capture. Archimedes (Scott Marley & Philip Cohen, 1988) features capture by triple line-of-sight; the goal is to move one piece into the opponent's base corner. Gyges (Claude Leroy, 1985) is played with pieces of one colour. And perhaps the currently most popular crossing game is Arimaa (Omar Syed, 2003) [*AG16*].

Stalemate games: the player (or the opponent) has no move.

This is called "blockade and restriction" by Parlett. Declaring stalemate, i.e., the inability to make a move, as either win or loss generally makes for short rules and drawless games. On the other hand, this win condition is prone to long games, and is by itself totally non-descript. For this reason, I file Amazons and Ayu, which both have stalemate conditions (the former a loss, the latter a win) as territory-scoring and unification games, respectively. These qualifiers describe what a player will think about during a game and therefore trump the formal notion, in my opinion.

There are games where the win/loss condition of stalemate is indeed the best characterization of what is going on. In my opinion, these tend to be boring, of the Nim type studied in Combinatorial Game Theory. Two nice exceptions are Quin (Solomon W. Golomb, 1953), about packing polyominoes, and Bug (Nick Bentley, 2017).

Other positional win conditions.

As indicated in the introduction, the are still other win conditions. Some of them relate to stacking pieces: in Santorini (Gordon Hamilton, 2004), players strive to get one of their pieces up to the third level; in Attangle (Dieter Stein, 2006), players aim to form three stacks of height three; in Pylyx (Christian Freeling, 2011), the goal is to combine all one's pieces into a single stack—a kind of vertical unification!

Yet another goal is the formation of a loop. A forerunner, Havannah (Christian Freeling, 1976) [Ag12], has this as one of its three independent win conditions, albeit arguably not the dominating one which is why the game is classified as a connection game. Loops require some pieces of the player but are not patterns because they can be of any size or shape. Neither do loops rely on distinguished zones, excluding them from connection games as presented above. The only looping games I am aware of are by Nick Bentley: Coil (2009) and Bobina (2017). As with any judgement on human activities, it takes a group effort to establish categories.

★★★

I hope this account justifies looking at win conditions in abstract board games from this point of view. It is neatly summarised in the Venn diagram on page 12. ■

Books mentioned

Harold Murray: *A History of Board Games Other Than Chess*. OUP 1952
Richard Bell: *Board and Table Games from Many Civilizations*. Dover 1969
David Parlett: *The Oxford History of Board Games*. OUP 1998
Cameron Browne: *Connection Games*. A. K. Peters, Wellesley, MA 2

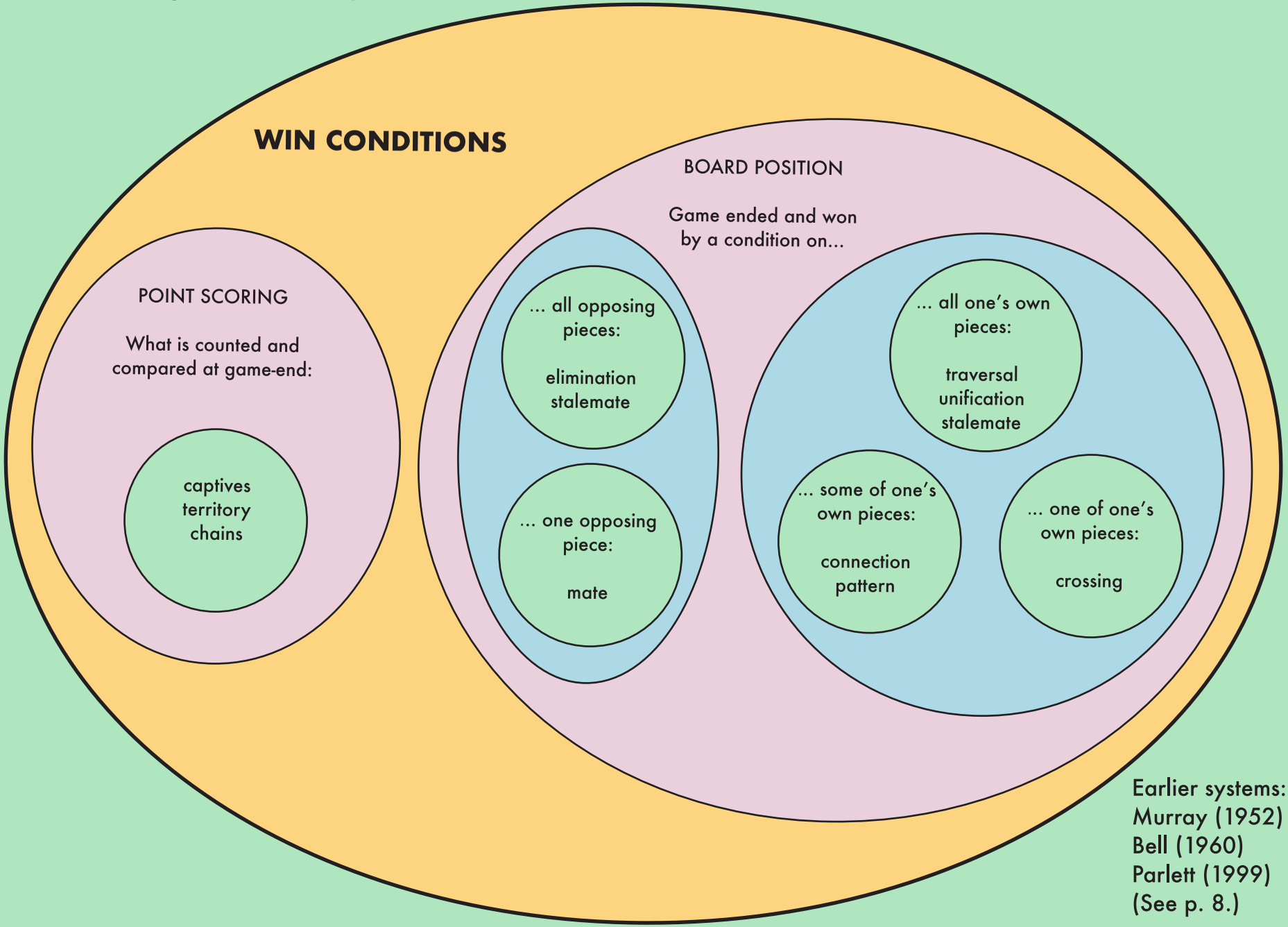
The article above by David Ploog is an excerpt from his coming book about abstract games. He focuses on significant two-player games with no luck, with simple board and pieces, and with pieces distinguished according to the player they belong to, but otherwise undifferentiated. He is a purist, and the games he selects are simple and elegant, although enormously varied in design.

*David's target list of games is Gonnect (*AG6*), Hex (e.g.,* AG2*), Havannah (e.g.,* AG12*), Slither, Halma (e.g.,* AG15*), Breakthrough (*AG7*), Epaminondas (*AG3*), Malawi, Cannon, Tablut (*AG16*), Dameo (e.g.,* AG10*), Fanorona, Focus, Emergo (*AG13*), Lines of Action (e.g.,* AG1*) , Minimize, Symple, Amazons (*AG16*), and Go. (Some games are covered in more than one issue.) The latter is a bit of a surprise, because Go is one of the most studied games in the world. However, Go is perhaps the most significant example of this class of game, and should not be omitted. The other traditional games in the collection are Fanorona and Tablut.*

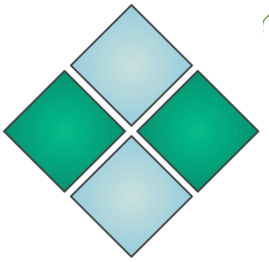
(Continued on p. 42.)

Classification of Game Win Conditions

by David Ploog



Earlier systems:
Murray (1952)
Bell (1960)
Parlett (1999)
(See p. 8.)



The Shared Pieces Game Design Competition

by Kerry Handscomb

In *AG7*, in Autumn 2001, we announced the winner of our first game design competition. The theme was games playable on a regular 8x8 chessboard, and the competition was organized between us and the Strategy Gaming Society. The winner was Dan Troyka's brilliantly simple Breakthrough, which has become quite widely played online. Interestingly, a recent retrospective of the competition by one of the judges, Stephen Tavener, places Larry Back's game Three Crowns at the top of the BoardGameGeek ranking of entries to the competition. We repeated these competitions every year, with a different theme each year.

The Unequal Forces Game Design Competition of 2002 highlighted games where the players have different pieces, or at least different circumstances, so that the games are asymmetrical. This second contest was won by Unlur by Jorge Gomez Arraussi, announced in *AG11*. Unlur is a radical revisioning of Hex, in which the players have different objectives. The mechanism to equalize the chances of the two players adds a layer of strategy completely unknown to Hex.

The Simultaneous Movement Game Design Competition of 2003 focused on games in which both players' moves occur simultaneously, for example, in Diplomacy, and other wargames. Assembly Line by Stephen Glenn won, which was announced in *AG15*. Assembly Line is unusual in that it incorporates a rock-paper-scissors mechanism, providing opportunities for bluff.

The next contest we ran was the Shared Pieces Game Design Competition. As of early 2004, entries for this fourth contest were in, some of the best games would have been highlighted in *AG17*, and then the winner would have been announced in *AG18*. The Strategy Gaming Society, in the absence of *Abstract Games*, chose Golem as the winner. Notwithstanding the quality of Golem, I really liked another game, SanQi. Of course, mine was only one vote, and I do not know whether it would have made a difference.

The following article on SanQi is based on the original file submitted to me by L. Lynn Smith. I lightly edited his work so that it agrees with our regular typography, and I added colour. L. Lynn Smith contributed enormously to *Abstract Games*. He had played much Jetan, and he masterminded the series of Jetan articles we published in *AG6*, *AG7*, *AG8*, and *AG14*. Then, he wrote six articles on 3D Chess, published in *AG10* to *AG15*. A seventh instalment, on Quadlevel Chess has been included here on page 43. In addition, He wrote articles on Gle'x in *AG11* and Arimaa in *AG16*. He contributed puzzles for various games in several issues.

In his game SanQi, there are pieces of three types. All pieces belong to both players and can be played by both players equally. Like Unlur, the game is made to work because the two players have different objectives. In the article, the designer outlines some fascinating tactics that arise, and hints of deeper strategies.

SanQi is playable on SuperDuperGames, along with Ithaka and Photonic Attack, two other creations by the author. No dedicated SanQi sets have been manufactured, although Nestor Games' Omega has the right board size and pieces.

In any case, please enjoy the author's article on his unusual game, SanQi. We may yet revive the game design competitions, and the proposed fifth is the Unequal Board Spaces Game Design Competition—see comments on page 28.

SuperDuperGames: http://superdupergames.org
Nestor Games: https://www.nestorgames.com/#bytype

SanQi

The game of three

by L. Lynn Smith

1 Introduction

The inspiration for this game came while studying the *Lingqijing*, "Spiritual Game of Change." The three symbols used by this Chinese work of divination made an impression upon me. Rather than creating a three-player game, I decided on a game of three types of pieces used equally by two opponents.

Needless to say, there began a long period of development. The decision of the playing field being the most significant. Once it was decided to use the hexagonal pattern for the field, rather than the plain square, rules began to fall into place.

2 Rules of the Game

One of the primary objectives in the development of SanQi was simplicity. But there also needed to be strategic depth for enjoyability. Often complicated games are good but suffer because of the difficulty in learning the rules, and simple games can be bad if they offer little strategy to hold the attention of the hard-core gamer.

This is a two-player game. These players will be referred to as First and Second according to the initial order of their turns.

2.1 Playing Field

The game will be played on hexagonal cells of an equal-sided field. This can be as small as four cells to the side and up. The smaller fields can be considered for learning and practice. Players may opt for larger fields as their skill becomes more pronounced. At this point, the ten-cell sided field appears to be the optimal size, but players may choose even larger playing areas.

2.2 Pieces

The playing pieces consist of three distinct types of tokens. Colours, such as Red, Yellow, and Blue, can be utilized, but the following symbols were the original markers. These are the three Chinese characters used in the Lingqijing.

上(Shang, "Above"). This was used to represent Heaven.
中(Zhong, "Middle"). This was used to represent Man.
下(Xia, "Below"). This was used to represent Earth.

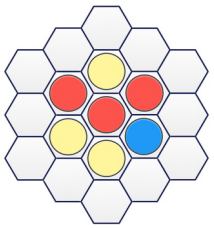
There should be a generous quantity of each of these markers. They begin the game off the field, and are the mutual property of both players.

2.3 Types of Moves
On each turn, a player may perform one of the following: *placement* or *replacement.* It is mandatory that each player perform a move during the turn. There is no passing

.2.3.1 Placement
At a turn, a player may *place* any one of the three types of pieces on any vacant cell of the playing field.

2.3.2 Replacement
At a turn, a player may *replace* any one type of piece on the field with one of another type under the following restrictions. There must be at least two more of the replacing type adjacent to the replaced piece than there are of the replaced type adjacent to the replaced piece.

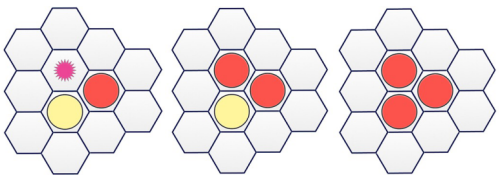
For example:



The Blue and the isolated Yellow can both be replaced by a Red. But none of the others can be replaced because there does not exist the necessary majority to effect a replacement.

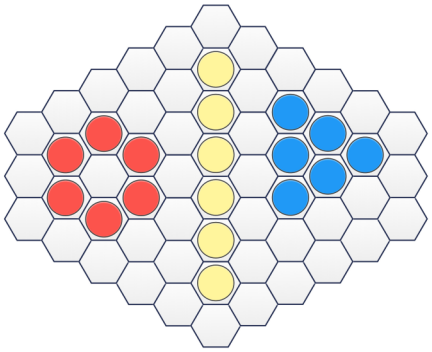
A player may not immediately replace a piece which was placed or replaced by an opponent for at least one turn. Using the above example, if the player had just placed the Blue, it could not be immediately replaced by theopponent. However, a player can replace a piece he has just placed on his very next turn.

Another way to understand the replacement condition is to consider the six pieces surrounding an attacked space, together with the attacked centre space itself, as a group of seven spaces. Then, the number of attacking pieces among the seven simply needs to be greater than the number of defending pieces among the seven. The three new diagrams below may better illustrate this point.



To the left, a Yellow or Red placement at the marked space is an attack on the opposing colour. Suppose a Red occupies this space, as in the middle diagram. Then the Yellow may be replaced because of the score 2-1 against it (2-0 in the author's original formulation). The diagram on the right illustrates the Yellow replaced. Replacement is simple and logical. ~ Ed.

2.4 Goal
Each player has different goals within the game. First wins if there is a circle of six pieces of one type, regardless of the condition of its centre cell, at the end of that player's turn. Second wins if there is a line of six pieces of one type at the end of that player's turn. Either player wins if there is a triangle of six pieces of one type, at the end of his particular turn.



Circle, line, and triangle.

Of course, the circles, lines, and triangles can be formed from other types of pieces. And the lines and triangles can have several orientations on the playing field.

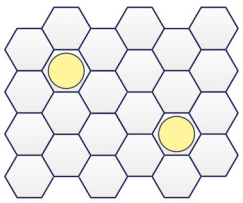
3 Opening Moves
Basically, First should concentrate on forming circles and Second on forming lines. The triangle threat is used to obtain positional advantage.

A player could begin the game by attempting to obtain their particular goal or, better yet, concentrate on staking out territories by placing anchor pieces. These placements might be misinterpreted by the opponent as mere random scattering of various pieces on the field. But what you would actually be doing is creating points for pattern growth. As these various patterns start to grow they will encounter neighbouring anchors or growing patterns.

First should be on the look-out for two or more pieces of one type in a direct orthogonal line of six cells or less. Second would be on the look-out for two or more pieces of one type within the six-cell pattern of a circle.

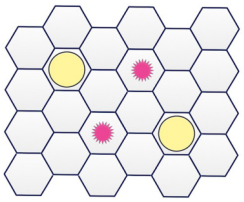
Utilizing the opponent's placement allows the player to gain an advantage of a turn. But the player must be careful not to aid the opponent in their particular goal.

4 Blocking Moves
Being able to block an opponent's developing pattern will become the foundation of much of the game-play. But being able to block is not enough, the player must be able to recognize and respond to the potential threats in good order or will quickly suffer defeat. Each player must watch for the developing patterns of circle, line, and triangle.

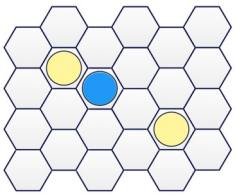


In the above example, Second has made a placement three cells orthogonal to the first. This is outside the goal pattern of a circle, and immediately gives Second two pieces within the goal pattern of a line.

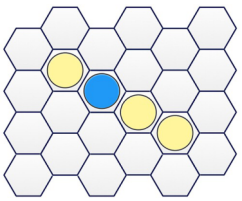
At this point, First has several options as a reply: continue with a circle pattern, block the potential line pattern, or begin the formation of a triangle pattern.



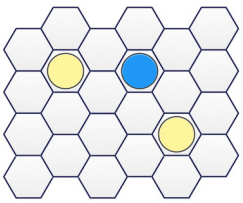
Placement at either of the two indicated cells will give First several advantages. Placement of a Yellow piece offers multiple potential circles with either of the two initial pieces and deters Second from immediately placing another Yellow on either of the two intervening cells of the potential line. Placement of either a Red or Blue gives First the ability to effect a strong block. The latter is extremely important. Let us look at a weak block first.



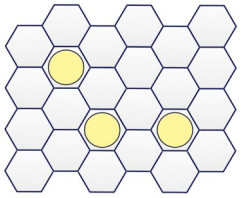
This example shows the position if First had merely placed a dissimilar piece within the threatening line. Second would then be able to force a series of placements for the next three turns.



For example, Second now threatens to capture the Blue on the next turn, thus completing two-thirds of the line. First is now forced to protect the Blue by placing more Blues around it. Second can play the next move to advantage, although First can effect a basic triangle trap (see **5 Tricks and Traps**).



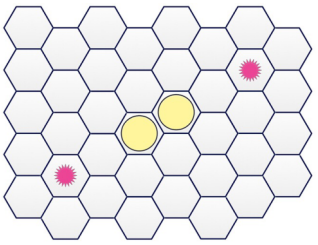
But if First made the above placement instead, this piece would support a similar blocking piece in either of the two cells within the potential line. Thus, it would give First the advantage of initiative, because Second does not immediately threaten capture of the future blocking piece, and First has the opportunity of choice in moves rather than responding to Second's threats.



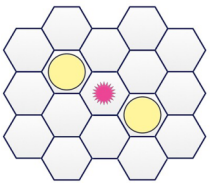
With the above blocking maneuver, also, First has gained a significant advantage. This move allows First to develop several potential circles. If Second was to place a Yellow in either of the two cells of the initial line, First would then be able to take advantage by continuing the potential circle and forcing Second to subsequently respond with defending moves.

For line threats of two pieces either adjacent or one cell apart, First need only incorporate them into a developing circle. For line threats of two pieces of three cells or more apart, First need only place a dissimilar piece within the potential line to begin an effective block.

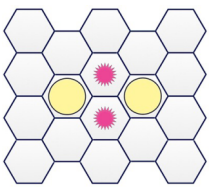
Now, let us look at some blocking moves for the circle threat.



If First places two pieces adjacent within a potential circle pattern, as above, Second can easily threaten a line by placing similar pieces in either of the marked cells. With this manoeuvre, Second would have the advantage of a move and could easily threaten a line.



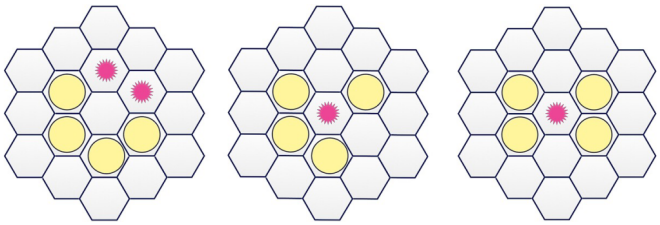
If First places two pieces one cell apart within a potential circle pattern, as above, Second can again easily threaten a line by placing a similar piece directly between them. This is a first example of blocking a circle by playing to its centre. First is unable to continue placing pieces within the initial pattern without creating a potential triangle (see **5 Tricks and Traps**).



If First places two similar pieces, in the above example, creating two distinct circle threats, Second has several options for response. These are indicated by the two marked spaces. If Second places either a Red or Blue, First is unable to replace it until at least one turn. And if First does not add another Yellow around this placement, Second can reinforce it. But if First does add another Yellow around this placement, Second could replace the Red or Blue and begin the development of a triangle threat.

Second can often block a circle by playing a similar piece to the centre of its pattern resulting in a potential triangle threat.

Even if Second has allowed First to build a circle to the extent shown below, there are effective blocking maneuvers.



In the first pattern, Second need only place a Red or Blue to one of the two vacant cells of the circle pattern. If First attempts to surround this placement in order to replace it, Second need only leave the centre cell of the circle pattern to last, thus thoroughly securing this blocking piece since First cannot replace the centre placement without offering a potential triangle to Second.

In the second and third patterns, Second need only place another Yellow to the centre cell of the circle pattern creating a triangle threat. These placements also offer Second potential lines.

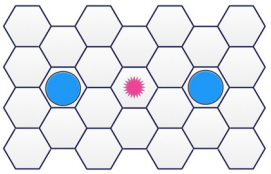
5 Tricks and Traps

Because of the basic blocking manoeuvres, the initiative will often swing back and forth between First and Second. So, players will need to make the most of the initiative.

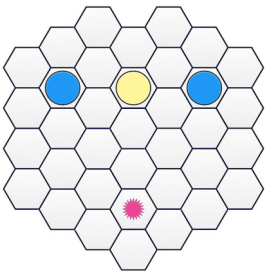
Pieces which are placed without any apparent positional advantage will be referred to as *anchors*. Pieces which create the potential of multiple patterns will be referred to as *pivots*.

5.1 Positional Tricks

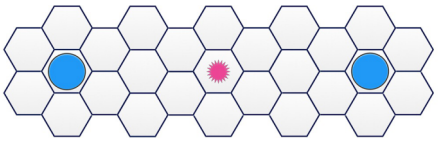
The basic trick is to create the potential of multiple win patterns. First will look to make several possible circle patterns and Second several possible line patterns.



The above diagram demonstrates a simple multi-circle threat. The two Blue anchors are not directly part of any particular pattern. By playing another Blue at the indicated cell, First now has the potential of four separate circles. If Second did not spot this threat, it can result in an excruciating series of forced placements.

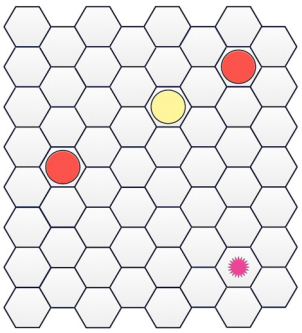


If Second attempts to effect a block, First can continue to create further potential multi-circle threats. The above example shows that Second placed a Yellow between the two initial Blues, and First then replies with the placement of a Blue pivot at the indicated cell. First now has two distinct multi-circle threats with which Second must contend.

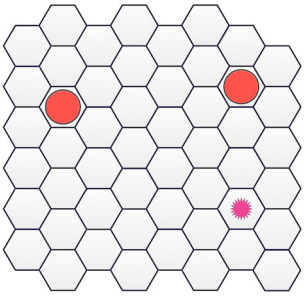


The above diagram also demonstrates the potential of a multi-circle threat.

However, Second is not helpless. There are several maneuvers which will aid Second in creating multi-line threats and taking the initiative, similar to the trick pattern of First, except that the pieces are located along orthogonally connected cells.



First has attempted with the Yellow, above, to block the line defined by the two Reds. Second creates a double threat with placement of a Red pivot at the indicated cell. This type of maneuver can take place with pieces which are various distances apart, both shorter and longer. The example above shows two threats of equal length.



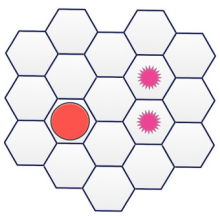
The diagram above demonstrates a double threat of unequal length. The two Red anchors do not offer First any particular positional advantage and Second is able to incorporate both in a direct double-line threat when placing a Red pivot to the indicated cell.

The double threat is not the only type of threat that Second has. There are possible triple, quadruple, quintuple and sextuple threats depending upon the size of the playing field.

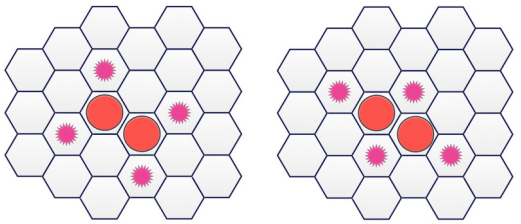
5.2 Attack Tricks

When responding to the various multiple-pattern threats, players should first concentrate on attacking the pivot, then particular anchors. Attacking a piece, with the intent of replacing it or negating its influence, can be divided into two categories, *solitary* and *supported*.

A solitary piece is one that is at least two cells from another similar piece. An attack on such a piece could be initiated with the intent of replacing the piece, or merely to misdirect the potential pattern.



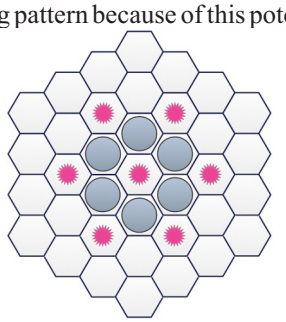
The above example demonstrates an attack on a solitary anchor piece. Rather than making a placement directly adjacent to the Red, which would only result in a series of forced moves for the attacker, placement is made one cell away. This does not guarantee the replacement of the Red but it does offer support for any following placements, regardless of the defender's immediate response. This placement can then be built upon to interfere with the opponent's possible patterns.



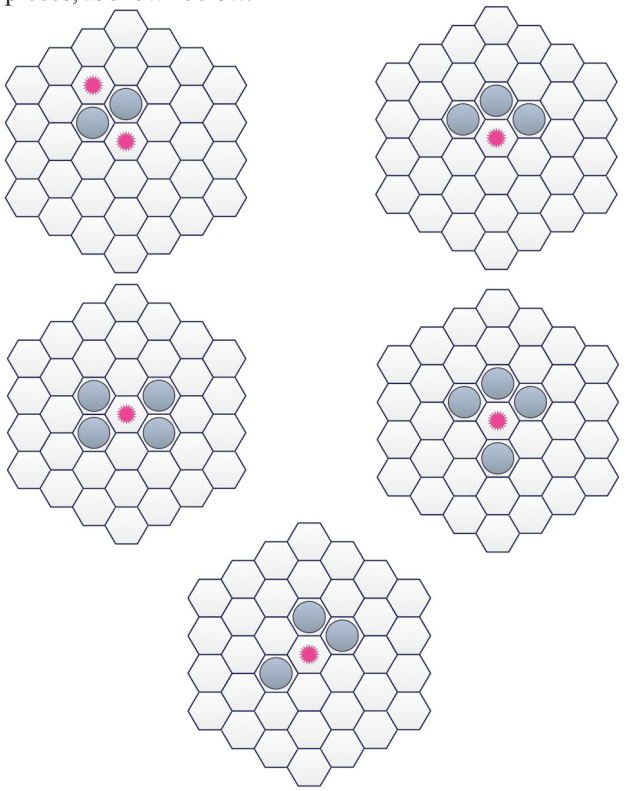
The two examples above show attacks on supported pieces. The one on the left shows First's response by placement of another Red to the indicated cells, resulting in the piece being incorporated into a potential circle. The one on the right shows Second's response by placement of another Red to the indicated cells. The orthogonal placements at the far ends aid Second by expanding the supported pieces into a potential line. The other two placements impede First's ability to form a potential circle (see **5.2 Triangle Traps**).

5.2 Triangle Traps

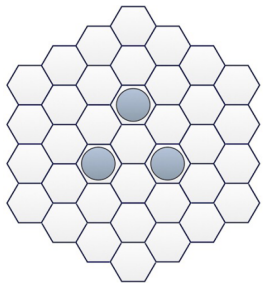
As stated earlier, triangles are the foundation of threats within the game. Since both players benefit from their formation, the trap is to force an opponent to place the fifth piece of such patterns, or to abandon a developing pattern because of this potential threat.



The above diagram demonstrates the various possible placement cells within and without a potential circle pattern. The grey pieces can stand for any colour. There will be several opportunies for such placements as First grows the potential circle pattern from two to four pieces, as shown below.

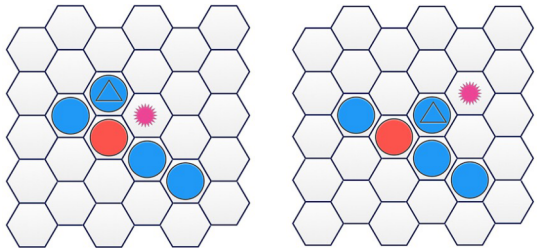


The above diagrams show the various positions that similar pieces might be placed to turn a potential circle into a triangle threat. Most do not need follow-up placements to complete the threat, so that if First continues completion of the intended circle pattern, this will result in offering Second a triangle pattern.



The above pattern is a very strong one for First, though even at this point Second can prevent a circle by making placements within and without the pattern. However, First can take most blocking maneuvers of similar pieces and generate other potential circle patterns.

First also has the ability to produce triangle threats with a line pattern, as shown below.



The diagram to the left demonstrates First's attempt to block the potential Blue line with a Red. Since Second is unable to replace the Red for at least one turn, Second replies by placing the marked Blue adjacent to the Red and a solitary Blue. First would then finish the triangle threat by placing another Blue at the indicated cell, thus assuring that Second will offer a triangle pattern by replacing the Red.

The diagram to the right shows if instead Second responds to the block by placing the marked Blue adjacent to a supported piece. First need only place another Blue at the indicated cell to complete the triangle threat.

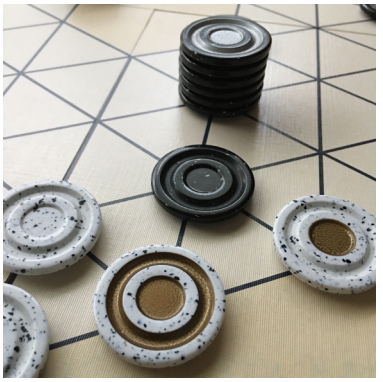
In both of these triangle threats, First is also able to form a large portion of a circle pattern to which Second must now respond.

6 Summary

By now the reader must realize that SanQi, although apparently simple, is quite complex in strategic depth. And this paper contains only the basic tactics to play an effective game. Establishing territories and blending abandoned patterns would take several more chapters to discuss fully. Yet the reader should be able to visualize these.

It is extremely difficult for a player to keep the initiative in this game. Each player will have the opportunity to play offensively and defensively throughout the game.

But another aspect of this game is that even after the playing field has become filled with pieces, the game continues. Pieces can still be replaced. The strategic foundation for this phase must be developed throughout the game and the tactics can be numerous. ■



A Beautiful Game of Tzaar

by Nikolas Axel Mellem

Tzaar, published in 2007, is a game in the Gipf series. Tzaar is unusual among abstract games in that it is typically played with a random distribution of pieces at the start, at least for competition games on Boîte à Jeux and Little Golem. Surprisingly, random starting positions usually give both players equal chances, notwithstanding the second player advantage discussed in the article below. A turn in Tzaar consists of a mandated capture, followed by an optional second move, which may be another capture or a stacking move. Each player has three kinds of pieces. A player immediately loses when one of her own piece types is eliminated. Through capturing and stacking the number of occupied points is constantly decreasing, often leading to sharp, close endgames.

Each diagram below shows the result after the annotated move that accompanies it. The odd-numbered moves by White are on the left, and the even-numbered moves by Black are on the right. The green lines refer to the mandatory first move; the blue lines refer to the optional second move.

White is Niclas Hjelm of Sweden (SlowBrain on Boîte à Jeux and Little Golem). Black is Nikolas Axel Mellem of Norway (Kokosz on these same sites). Nikolas Axel Mellem is the author of this article, while Niclas Hjelm comments on the game in the italicized paragraphs. In email communication in summer 2019, Nikolas wrote, "I always remind myself that if you do 11-14 good moves you will probably be fine in the game. One thing that made me progress from strength 2200 to around 2500 is the understanding of the importance of the initiative (for its own sake, so to say). You make positionally 'bad moves' but then you keep pushing your opponent until he suddenly is forced to misplace his important stacks." The author adds, "Back then I had only 2030 rating on Boîte à Jeux, but I agree with SlowBrain when he said that this game is probably the best ever played."

Nikolas Axel Mellem (1982), from Norway, was originally a Chess player and historian, who in 2011 started exploring diffferent strategic games, from ancient chess variants to modern board games. He has reached a 2000+ rating in 18 different board games, and has won championships in Tenjiku Shogi, Havannah, and Tzaar. Nikolas is currently rated #1 in both Tenjiku Shogi and Hnefatafl, and #2 in Tzaar. ~ Ed.

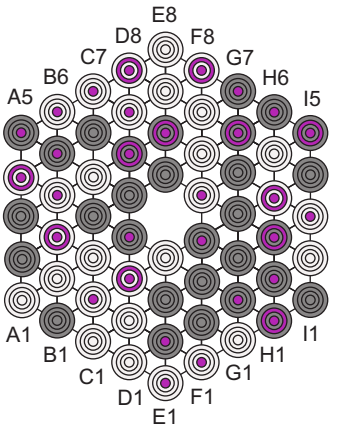
Tzaar rules: http://www.gipf.com/tzaar/rules/rules.html
Little Golem: http://www.littlegolem.net/jsp/main
Boîte à Jeux: http://www.boiteajeux.net

The game annotated below was played on Boîte à Jeux between SlowBrain (White, rating 2605) and Kokosz (Black, rating 2031) between March 1 and March 27, 2016.

SlowBrain is by far the highest ranked Tzaar player ever, with his astonishing best rating of 2646. He started playing Tzaar on Boîte à Jeux back in 2010. As of April 1, 2016 he had played 560 games, for a score of +445 -115 (79%). SlowBrain participated in all ten Boîte à Jeux championships held between 2011-2015. He won an incredible eight golds and two silvers, with the astonishing score of +86 -6, which is a performance beyond the intelligible sphere.

Champ.	Year	Place	Points	Games
1	2011	1	8	10
2	2011	1	10	10
3	2012	2	8	9
4	2012	1	10	10
5	2013	1	10	11
6	2013	2	8	9
7	2014	1	9	9
8	2014	1	8	9
9	2014	1	8	8
10	2015	1	7	7
Σ			86	92
			94 %	

Kokosz started playing Tzaar in 2015, and between November 2015 and January 2016 he scored a strong +27 -3 on Boîte à Jeux, with rating performance around 2200. In the first ever Little Golem Tzaar Championship he took third place. By March 1, 2016 SlowBrain and Kokosz were ranked respectively #1 and #7 on Boîte à Jeux. Here is the starting position of their game.



Modern Tzaar is played almost exclusively without the placement phase and with random setup. This gives the game extreme speed—practically a maximum of 28 half moves, with exciting variance. So what about our random start position? Well, what makes Tzaar so fun is the game's fantastic complexity, which again

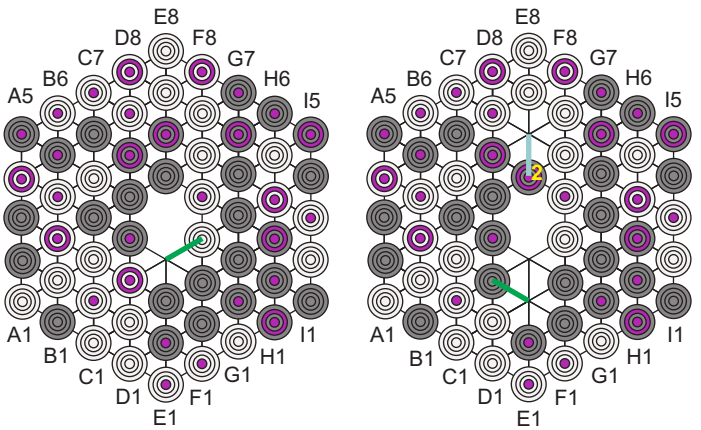
makes understanding of the game very difficult. Personally I like a good distribution of my pieces, especially of Tzaars and Tzarras, and I dislike it if my pieces are clumped together. I also like having Totts in corners because nobody likes to use time capturing them so far from centre, and not seldom you can end up having an isolated single Tott! So what about the current starting position? It seems quite all right for both sides.

The creator of the strongest Tzaar engine—Czech, Pavel Vesely—was discussing the White versus Black equity, suggesting that Black was better as she could stack first. I would argue that not only is it an advantage, but a relatively clear one. The main reason for my claim is that I would question White's advantage in capturing the first Black piece. Of course, in the long run Tzaar is about capturing opponent's pieces—but do not forget that you also lose if you have no pieces to take. So by taking the first piece and not being able to stack, White has just lost one potential piece to capture. Also, the standard move of White capturing a Black Tzaar piece does not give White much benefit, as Black follows up by starting to build a Tzaar tower. These are of course superficial thoughts, and the reality is complex. What would be beneficial are White versus Black statistics.

Let us hear what SlowBrain tells us about the White-Black imbalance:

There are too few games played between strong players to create a reliable statistic. Though I am pretty sure that Black takes more than 60% in games between the 10 strongest Tzaar players on Boîte à Jeux. My guess is that Black could even be a 2-1 favourite, that is take more than 67% of the points.

An extra rule I have thought about is that Black in her first move can only stack on the edge points of the board. I am pretty sure that Black would still win more than 50%, but it would make the game more even, and I guess Black's winning percentage would fall below 54%. A rule like that would possibly result in less confrontational games in the first 2-3 moves, but the game would became very complicated after that, so I do not think you would miss anything by implementing such a rule.



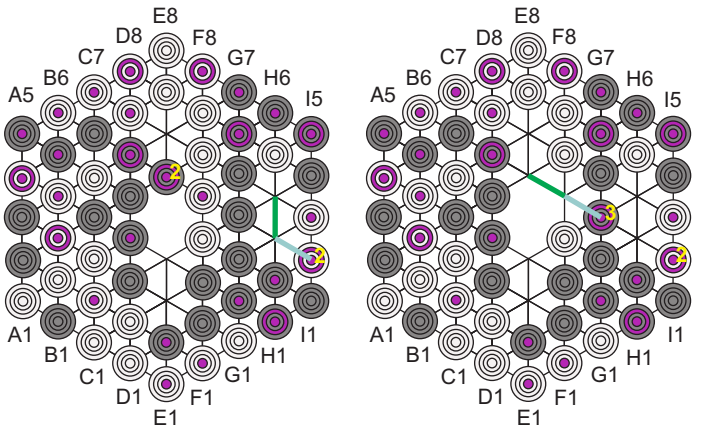
1. e4xf4

First move, and SlowBrain is not capturing my Tzaar? What is happening here? Now, do you remember my statement about White capturing a Tzaar and Black building up a Tzaar tower? Well, this might be the answer to understanding SlowBrain's atypical move. With a 6-8-15 distribution I still of course ought to stack a Tzaar, but now I have instead one Tzarra less. Why have I not thought about this before?

2. e3xd3 e6-e5

Nothing seems more difficult to me than finding meaningful moves in the beginning of a Tzaar game. I also guess many Tzaar players just simply play something and await the sharper middle- and end-game phases. It would of course be extremely interesting to hear SlowBrain's thoughts about the opening. So I just take a White Tzaar. The idea of taking the most central Tzaar is to hinder White from getting an active Tzaar tower in centre. Still, this might not be so dangerous, since central stacks can also get isolated, especially later in the game. Secondly, White's Tzaars are very well distributed and I like taking one that is quite far from my own tower. I stack with a standard move, placing a Tzaar on a Tott.

Lately, a bit inspired by games of the first Little Golem championship winner Kerry Handscomb (Boite à Jeux rating: 2044 and best 2230), I stick to the strategy where the main tower is placed in the centre. This strategy is also advocated by Pavel Vesely. With a bit more practice on Little Golem since this 2016 game, it has become more and more clear to me that centre-stack with Black is the right thing to do, with the purpose of creating pressure on White's Tzaar stacks.

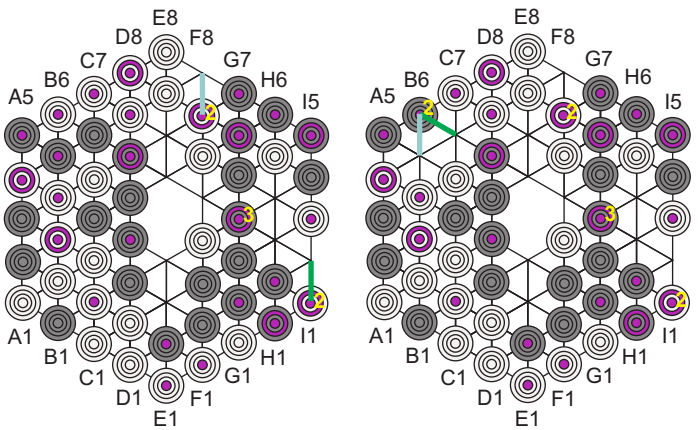


3. h4xh3 h3-g2

White creates a Tzaar tower on the edge, taking Black's Tzaar, and stacking on his Tott.

4. e5xf5 f5-g4

Stacking a Tzarra, stacking on a Tott, and putting pressure on White's Tzaar stack. While playing against such a strong player, I want, besides playing well, also to play as usual by not making moves that are too "deep," since I really do not want to lose due to my own stupidity.

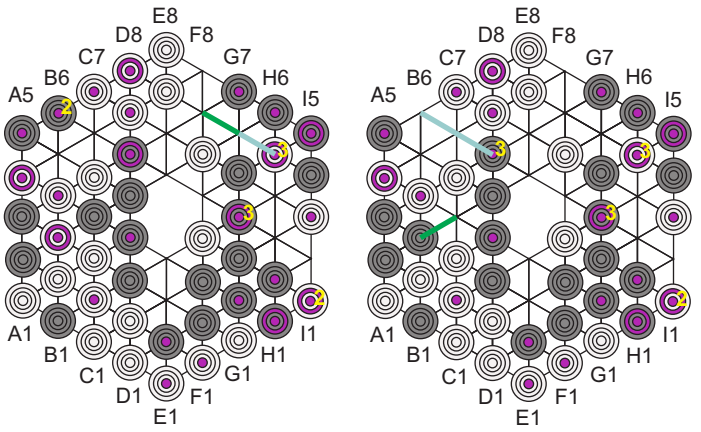


5. i2xi1 f8-f7

White captures my dear corner Tott and stacks a new Tzaar on Tott in the north-east corner.

6. c6xb6 b5-b6

I am capturing a Tzarra and stacking a Tzarra. The move is on the other side of my 3-stack Tzaar, but keeps a connection with the main tower by being on the same line.



7. f7xg6 g6-h5

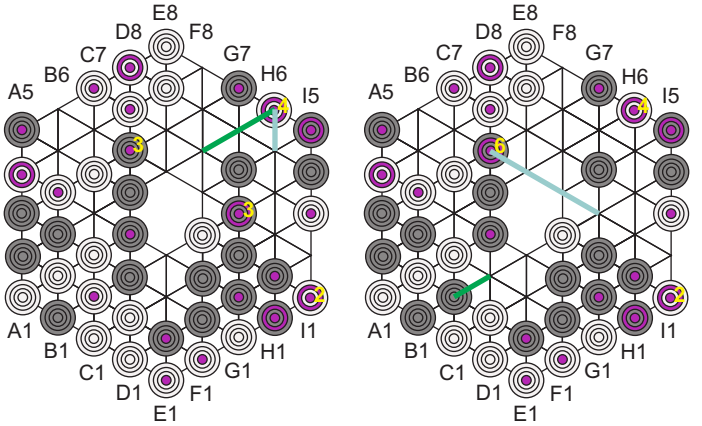
SlowBrain is not sitting passive and waiting for someone else to create action. With the next move he threatens both my 3-stack and potential Tzaar-stack union. On the way to h5, White also captured Black's Tzaar, losing a Tott in return, which of course could not have been better.

White is planning to build a 5-stack at h5 or h2, or to play with two stacks, depending on the circumstances.

8. c4xb3 b6-d6

Black captures a Tzaar in the first move. The second move, stacking a Tzarra by losing a Tzaar myself, seems not completely optimal. However, I need to be able to create a high Tzaar tower as fast as possible, and first of all protect my 3-stack. In order to do this move I was also forced to calculate a bit on the 9. h5xg5 g5xg4 possibility, where White goes for my last Tzaar. However, I am fine after, for instance, 10. d6xg5 h1-g2, 11. i1xh2 h2xg2, 12. g3xf4 i5-i4.

Two large Black stacks, centrally placed, is very powerful. If White now makes the 5-stack, Black will make a 6-stack. White's opening play was probably not optimal, and I think Black's advantage has increased.



9. f6xh6 h5-h6

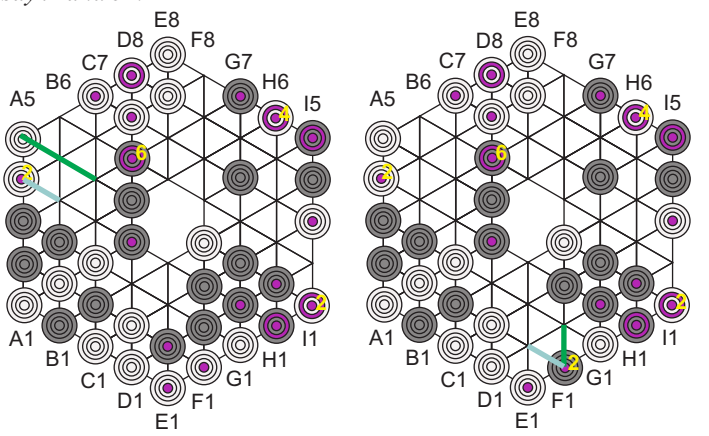
SlowBrain continues to threaten my stacks, and at the same time keeps his stacks connected.

The 2-stack is quite safe. There are only blacks around it, so it will take some time to capture it.

10. d3xc2 g4-d6

Tired of the threats, I connect my stacks. The capturing move is, in addition to taking a Tzarra, meant to give me more space on the left wing in order to safely create a new Tzarra stack. By now the goals are becoming clear, and I would say we are definitely in the middle-game phase.

Huge stack, centralized. White's counterplay is now against the Tzarras. Two smaller stacks might control a larger area than one huge stack, but the White stacks would be better on say i1 and b2.



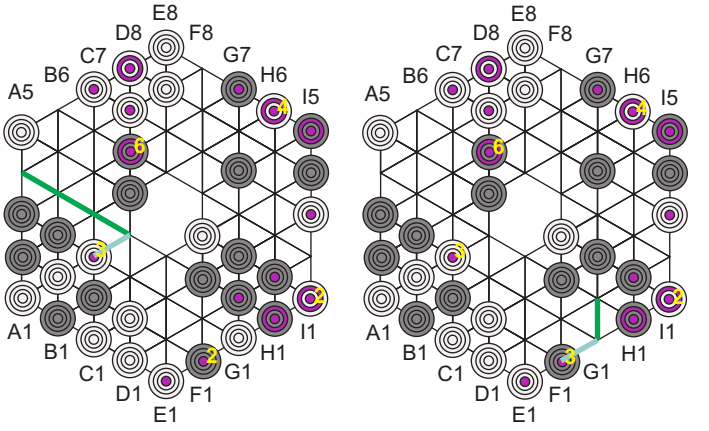
11. c5xa5 b4-a4

SlowBrain is glad to place this Tott in the corner and at the same time capture one of my Tzarras in the important north-western side. At the same time, White establishes a Tzarra stack. This Tzarra stack can be captured, but at the expense of not being able to stack. This trick is based on the fact that it is often beneficial to have less pieces than the opponent, once you are coordinated, as this makes it more difficult for your opponent to capture pieces.

12. f2xf1 g2-f1

I was thinking about the double Tzarra capture on d7 and a4. However, I thought SlowBrain would just create a new Tzarra stack and I would still sit back with my Tzarra problem. The next move creates a Tzarra stack while I also keep a bit of pressure on White's Tzarras.

Black is threatening f1xd2-d4 with a big advantage.



13. a4xc4 c4-c3

White continues to build on his Tzarra stack sending it closer to the south and my vulnerable Tzarra stack. At the same time White also captured a Tzarra from me. So what is the position? White has more stacks and control over the board. I am also struggling a bit with my Tzaar stack mobility. The biggest weakness for me though are my Tzarras, so I have to act carefully with my Tzarra stack. On the positive side for Black, White has a concentration of single stones in the north that are clumped together. If I can penetrate this area and maintain control over my stacks, then it could prove dangerous for White in the endgame.

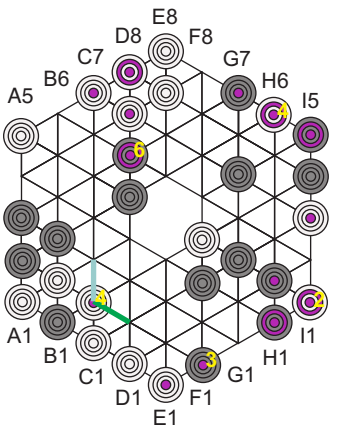
Yes, if the game ends with "cannot-capture" (that happens in maybe about 25% of the games) then Black will win, so Black has really achieved something here. White's counterplay is based on the fact that Black will find it difficult to build a second

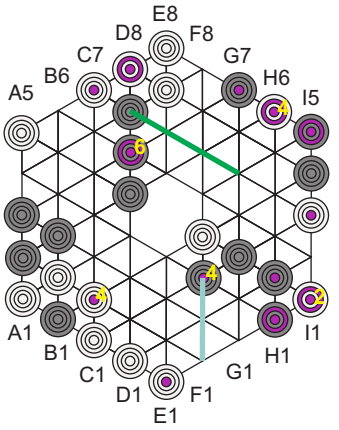
stack of Tzarras, so at least the target is located: The stack at f1.

14. g2xg1 g1-f1

Killing off one of my Tzarras is not something I liked to do in such a position. However, I tried to be concrete and positive about the strength of my Tzarra stack. Also, when we approach the endgame, I have to start thinking about creating a Tott stack.

Here I felt I was hesitating and possibly made a mistake. If 15. i1xh2-h6 with a triple threat (one way to hit the stack of Tzarras and two ways to hit the stack of Tzaars), 16. f1xd2 d6-d5 seems reasonable, and then 17. h6xg7 c3-b2. This might be an improvement over the game. I think the Black stack of Tzarras will survive, and White's Totts are in danger. (Black's d2xd1 f3-h1 is one option to guarantee the existence of the stack of Tzarras.) What do you think?



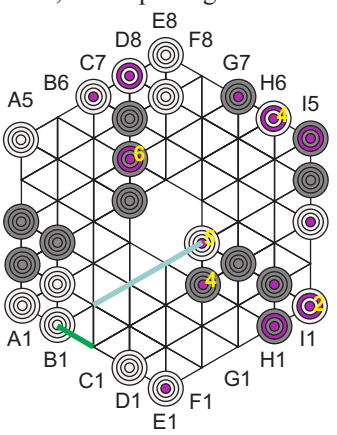


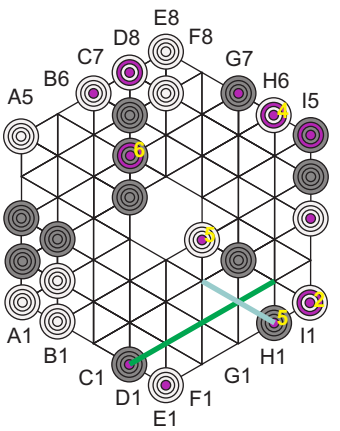
15. d2xc2 c3-c2

Stacking the Tzarra and threatening Black's Tzarra stack.

16. g5xd7 f1-f3

Running away with my Tzarra while stacking it to 4 seems almost obvious. The capture move was of course more difficult. There were many candidates, but I thought planning to build a Tott stack in White's single-stone colony would be a good idea. At the same time, I am capturing a Tzarra.





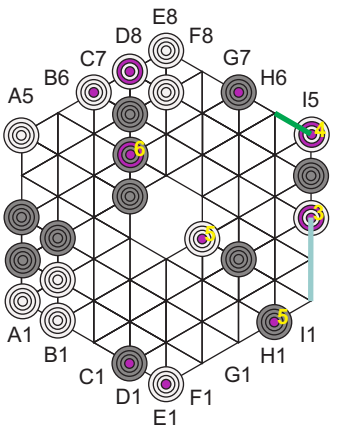
17. c1xb1 c2-f4

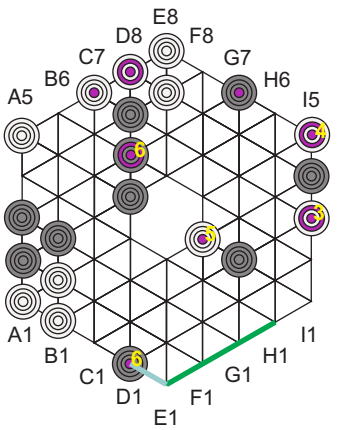
Defending and attacking at the same time. Notice how the capturing move took away the c1 point from my Tzarra stack.

18. h2xd1 f3-h1

The only move! If I just stacked and did not mind taking on d1, White would play 19. h6xh2 h2-h1 and capture my Tzarra stack in next move.

> *"Games are the most elevated form of investigation."*
> *~ Albert Einstein*





19. h6xi5 i1-i3

Logical move, where both stacks flee from Black's powerful Tzarra tower, and threaten to isolate the Black stack at the same time (e1xd1).

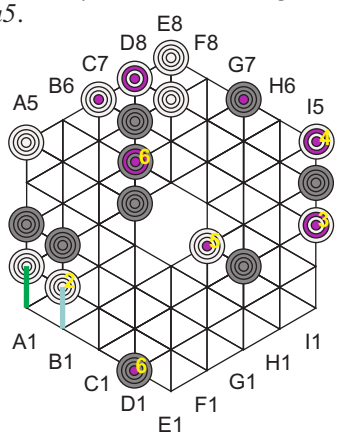
White had to abandon i1 so now the stack of Tzarras is quite safe.

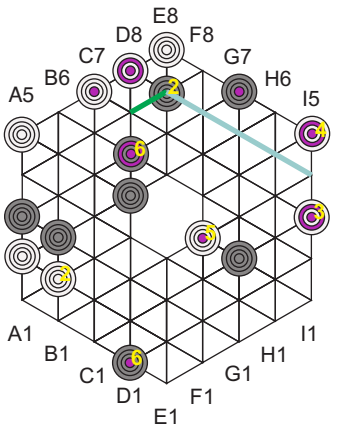
20. h1xe1 e1-d1!!

At this point I stopped commenting live due to lack of time. Also, around this time I received a Tzaar board in the mail. After doing some analysis, I thought I was slightly worse, finding some long 27 move victories for my prominent opponent. My problems are the loose Totts in the east, general Tott weakness as White seems to be ahead in time and can stack a Tott tower first, and the problem with my Tzarra tower that can easily be isolated. Still, I have very strong Tzaar tower in the centre, and also the play seems straightforward, so I thought I had practical chances left.

A very strong move anticipating a White 6-stack at b1 heading for e1 (then d1xe1-h1 saves the Tzarras, but they will be out of play, and White will win the game in some other way).

The move threatens White's 5-stack and since b1 cannot capture, White must use the stacking part of his move for defence! Black also plans to get a 2-stack of Totts at e7, where it will be safe. Now White's 5-stack will be out of play, unless he plays something like d8xd7-e7, d8xd7 c7-a5, or f4xg3 c7-a5. But all White categories are in trouble and Black will play a2xb2 b3-b2 if necessary. Also, d1xb1 is a good idea and d6-a3 hunts the stack at a5.





21. a1xa2 b1-b2

As expected, White builds a Tott stack and takes at the same time points from my Tzarra tower.

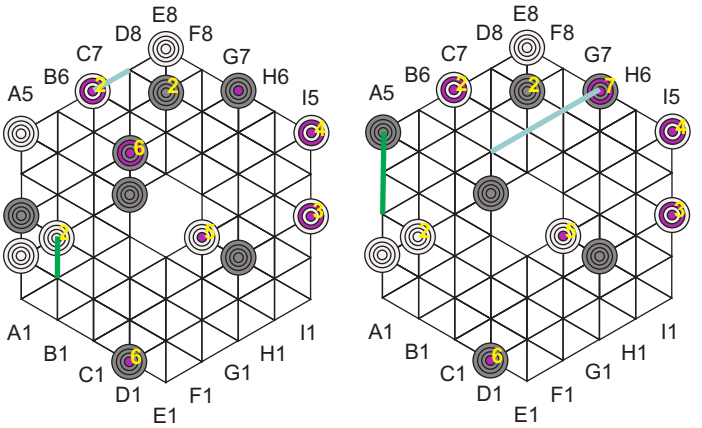
The question now is, can Black get a safe stack of Totts? Not so easy, but I think he can.

22. d7xe7 i4-e7

I did not find anything other than nice White wins in all variations. However, I was very pleased with the text, as I was sure I found the

best defending move, demanding precise play from White. My Tott stack is of course vulnerable, but White needs also to be careful about his Totts.

Now 23. i5xg7-e8 looks like a good idea but it does not work. Black can even play 24. d6xd8xe8, for example, and then 25. a2xb2 c7-a5, 26. a3xb2 d1-d5. There are also other wins based on calculation rather than positional factors, such as 24. d5xa5 d6-a3, and White has only two Totts left. 25. a2xb3-b2 is forced, and now most moves win since White had to let the single Tott at a3 live—for example, 26. d1xd8 a5xc7.



23. b2xb3 d8-c7

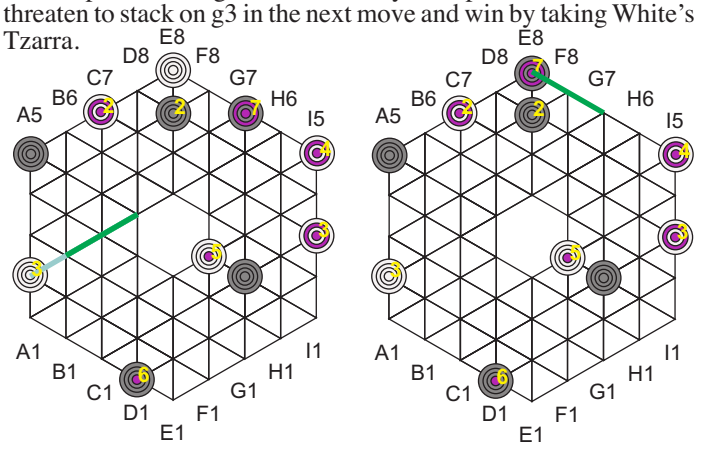
The Tzaar on c7 creates an outpost for a potential Tott stack. The capturing move also threatens to isolate a beneficial Tott stack if necessary for White, but first of all hinders Black in making a new Tott stack himself.

In retrospect, after the game is finished, I think I am dead lost here. The moves played in the game were my intention, but there is a flaw in my calculations at the end…!

When d1-d5 comes, White wants Black to have as few captures as possible from that square; but in the game played there are three, which is one more than I can afford. I would be glad to sacrifice a large stack with i3-c7, but Black just ignores it and moves the stack from d6 to g7 to g3. I must put pressure on the stack at e7, but I do not see how. Black also threatens b2-a3, and I will run out of captures very soon. The move played limits Black's options with the Tzaars, and I may make a 3-stack at e8 at some point.

24. a3xa5 d6-g7

At this point I thought this move my best practical chance, as I threaten to stack on g3 in the next move and win by taking White's Tzarra.



25. b3xd5 d5-a2

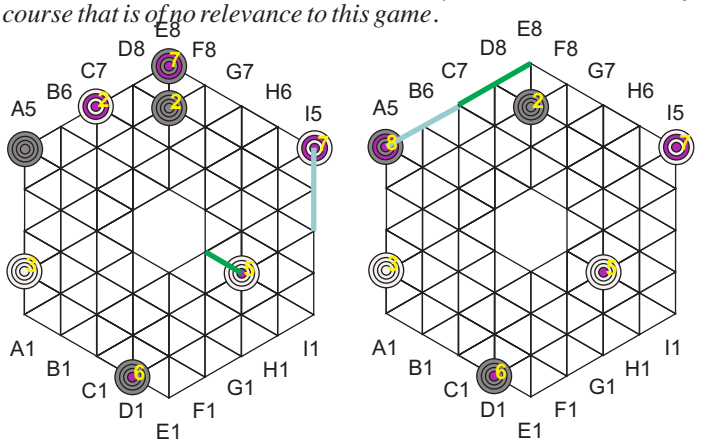
If 25. b3xd5xa5, Black wins by 26. g7xe8 pass.

As expected, White almost isolates his Tott stack, and puts my Tzarra tower out of play. In this position, my original plan was to play now 26. e7xe8 e8xc7, because I thought this would make the game last for 3 more moves as White cannot take all my three Totts at once—27. i3xc7 c7xa5, 28. g7xi5 (forced) pass, 29. f4xg3 pass 1:0, which makes the game 29 (half) moves long! However, suddenly I discovered White could play 27. a2xa5 i5-i3! instead, winning at once by my inability to capture! So my nice plan to lose in 29 against SlowBrain did not work out, and I had to look for other moves. Which continuation loses in the most fancy manner?

26. g7xe8 pass

I found out that I at least could start with capturing on e8 with my Tzaar. Then I thought about adding a pass and started pondering about White's responses. Suddenly it struck me that White was having problems with his Tott on a2! I want to capture on c7 and stack on a5. The c7 Tzaar has to move away then, but where? White has actually 22 possibilities, but all lose! The enchanted Tzaar tower connects with all pieces on the board with the exception of the lonely Black Tzarra!

Black wins because there is a double threat to reach i3 combined with the following fact. White has double threats at a5 and at g3. That is a disadvantage in the endgame when you try to win by "no captures" (but might be an advantage when you try to win by "capturing all X's" because you can merge two stacks), since when you capture with one piece both that and the other attacker are now aligned and both can be captured. If the a2-stack would have been at b2, White could win by 27. c7xa5 i5-i3, but of course that is of no relevance to this game.



27. f4xg3 i3-i5

SlowBrain wrote to me that he had missed the pass at move 26. He wrote: "Well played! I thought I had unclear play, but never worse than unclear," which I take as a huge compliment, since I thought the game even for a long time, and lost for me by a small margin after SlowBrain's 19th move. The difficulty of finding the winning 26th move is also to me one of the biggest lessons of this game—what you do not expect you will fail to find! The combination of meeting a very strong opponent and feeling that your position is worse, makes you completely blind to hidden possibilities.

28. e8xc7 c7-a5 0:1

I really like the ending position—three pieces each left with both players still keeping their Tzaars, Tzarras, and Totts. Simply, White cannot capture, and no one can blame him for losing a piece type. Also, I love to win without capturing my opponent's pieces—after all, I do not want to steal other players' pieces and be accused of being materialistic!

This must be one of the most well-played games I have been part of, maybe even the best. There were lots of "the best move" situations; I cannot see any improvement for White, and I never thought of any of the Black moves as incorrect either! ■

"Games are nature's most beautiful creation."
~ Leonard Cohen

Katarenga

A game with unequal board spaces

by David Parlett

Described by one reviewer as "Chess on steroids,"[1] Katarenga is not in fact a Chess variant, since it lacks the defining feature of king-capture. But it does use Chess moves, and I content myself with characterizing it as a 'Chess-flavoured' abstract.

It was published in October 2017 by Huch Spiele,[2] who specialize in abstracts, but with different rules (and title) from those I originally presented them with. I will therefore describe the game as published, and revert to the original later.

Huch have yielded to the temptation of dressing it up with a background story. It reads:

"The Persian Empire around 300BC. Two powerful armies face off to decide the victor and the vanquished. The goal for both armies is to occupy the enemy's camp…. Whoever displays the cleverer tactics and is the first to get two of their pawns over their opponents baseline, or ensures that their opponent has no chance of conquering both their [own] camps, will prove themselves to be a brilliant strategist and win not just their battles, but also the game."

More prosaically: Katarenga is played on an 8x8 board, with 16 squares in each of four different colours [Fig 1], plus eight black and eight white pawns. For each session the board is newly constructed from four double-sided asymmetrical quadrants randomly arranged to form thousands of different whole boards. The lower four are the reverse sides of those immediately above.

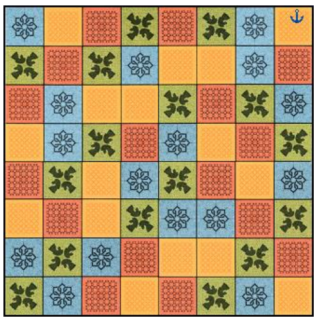


Figure 1: Katarenga board ready to play.

A pawn moves according to the colour of the square it currently occupies: on a red square like a rook, on yellow like a bishop, on green like a knight, on blue like a king. When moving from a red or yellow square it may not travel beyond the next square of the same colour that it comes to.

It may not pass over an occupied square, except when moving hippogonally (knightwise).[3] Nor may it land on a square occupied by a pawn of its own colour. If it lands on a pawn of the opposite colour it captures and removes it from the board. Illustrated [Fig 2] are all possible opening moves from Black's green and blue squares and White's red and yellow squares.

A variety of games can be played with the same board and rules of movement. In the basic game, "Katarenga," your aim is to get two of your pawns across the board from your baseline (the row nearest you) to your opponent's baseline (opposite). Having got a pawn home you then, if it is not captured, in a subsequent turn move it over the edge and position it on one of the two enemy camps (the elaborately decorated squares at the corners of the frame). You can also win by capturing all the opposing pawns.

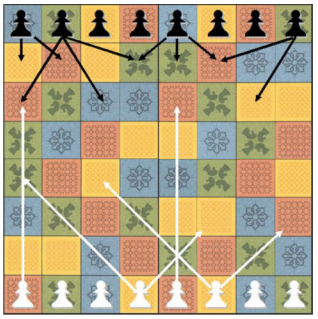


Figure 2: Possible opening moves in Katarenga.

In order not to frighten potential players, a game is said (on the box) to last about 20 minutes. In fact, an hour or more is not unusual.

For the sake of argument, Black starts by nominating one side of the board as their baseline, leaving the other to White, who then makes the opening move. It is recommended that a session consist of two or four games played on the same layout, but rotated by 90 or 180 degrees between, and with the opening move alternating between White and Black. This gives both players one opportunity each of starting from a given side in case the layout happens to favour one player over the other.

Background

Early editions of *Games & Puzzles* magazine[4] ran articles about a newish game called (amongst other titles) Take the Brain (Parker Bros, 1970) [Fig.3], by Perry Grant and Reuben Klamer. Being into Chess at that time, I was intrigued by its novel idea of having pieces move according to the square they were on in addition to having their own individual powers of movement. The direction of travel from any given square was indicated by arrows, in various combinations of orthogonal and diagonal, while the distance was inherent. "Ninnys" moved 1 square, like kings, and "Numskulls" moved any distance, like rooks and bishops. The object was to capture your opponent's "Brain," equivalent to and moving like a chess king. The artwork was brilliant and the theme light-hearted, thus rendering it more family-attractive and marketable.

Figure 3: Take the Brain board.

Trippples, with three P's,[5] followed a similar principle [Fig. 4]. Two players start with one piece each on diagonally opposite

corners of an 8x8 board and race to be the first to reach the other's starting-point, moving one square at a time. The board is initially dressed with 64 tiles, placed one at a time by the two players alternately. Each tile is marked with three arrows in different combinations of three compass points. A nice touch is the pieces are transparent, and move not according to the tile on which they stand but on that currently occupied by the opponent's, so that your particular choice of move dictates your opponent's options as well as your own. Another clever idea, but, according to my memory, lacking attractive production values.

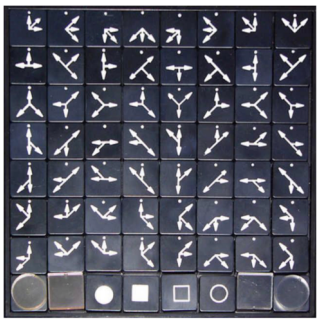
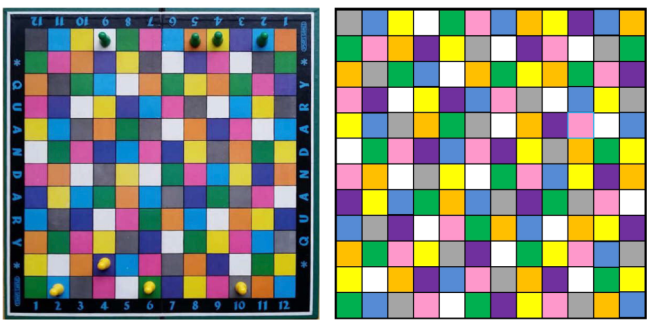


Figure 4: Trippples set.

More attractive than Tripples but less light-hearted than Take the Brain was Quandary, of unknown authorship,[6] published by Spears in 1970 [Fig 5, 6]. Quandary is played on a 12x12 board consisting of 18 squares each of eight different colours in an arrangement which, if not entirely random, is disconcertingly asymmetrical. (Quasi-random? Controlled random?) You each start with four pieces on different squares of your home rank and race to be the first to get all four to the opposite back rank. (Which four depends on the draw of cards from a shuffled set of 12—a needless frippery, as the game is just as good if you position them ad lib.) At each turn you move one of your pieces to one of the squares immediately in front of it, but only to one of the same colour currently occupied by any opposing piece. You can therefore reduce your opponent's options from a maximum of 12 to just one, by getting all your pieces onto squares of the same colour. Quandary is as attractive as it is ingenious and, after 50 years, still remains one of my favourites.



Figures 5 & 6: Quandary in play, and image of board.

My first attempt at an abstract with a colourful, variable board was called Mondriaan (with two As, unpublished, 1976) [Fig 7]. For 2 to 6 players (4 best), it featured a 12x12 blank board on which 104 separate tiles were more or less randomly distributed before play. The tiles came in six primary colours plus black. Each player started with four tokens of a personal colour equally distributed among the four corners. The aim was to get all your counters built up in a pile on a square of your own colour. Blacks and whites (empty squares) were respectively blockers and delayers. You could move any distance orthogonally along unoccupied squares, without landing on or passing another piece. If in course of travel you reached a square of your own colour you had to bounce off it at a right-angle, but could not land on one until you were ready to make it your homing square. The point of this was that the board became a fairly elementary maze slightly different for each player. There was no capturing, but in certain circumstances you could land on an opposing piece and "oust" it by returning it to any corner square of your choice, thus forcing it to start again.

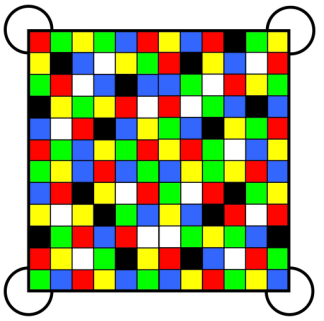


Figure 7: Mondriaan board.

I still like this idea, but (a) it was too fiddly to set up and (b) who wants an abstract for more than two players?

My second was Colorado (unpublished, 1984), for two players [Fig 8]. It was based on an 8x8 board with 64 squares divided between eight colours, no two of the same colour in the same row or file. (It was in designing this that I discovered the impossibility of superimposing eight versions of the eight-queens-on-a-chessboard problem.) Variability was obtained by initially agreeing on one of the eight colours and then covering those squares with pieces representing rocks—evidently because I envisaged some sort of theme based on crossing a river. (Does the Colorado have a rocky crossing?). You each started with eight pieces ranged on an additional rank your side of the "river" itself, i.e. on the bank, and your aim was to get "all your pieces" across to the opposite bank. You could move any distance horizontally or vertically but not pass over another piece, nor land on or jump over a rock. "All your pieces" goes in inverted commas because, although landing on an opposing piece resulted in its capture and removal, each capture only served to reduce the number of pieces you needed to get across, so you could still win with only one left on the board.

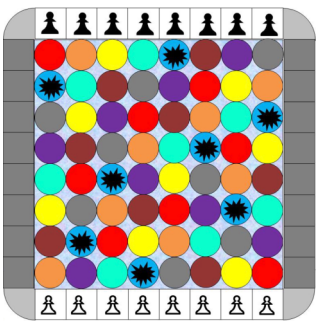


Figure 8: Colorado with 'rocks' placed (by agreement) on blue spaces.

Neither of these two games seemed strong enough to offer for publication, and I rather regretfully gave up on the whole underlying idea. What revived my interest was Peter Burley's Kamisado, first published by Burley Games in 2008 [Fig 9] .

Figure 9: Kamisado board.

Kamisado is played on an 8x8 board with squares of eight different colours, one of each appearing in each row and column. You each start with eight similarly-coloured 'dragon towers' on your back rank and move them forward vertically or diagonally, but not backwards unless "pushed" by a promoted enemy tower. It is, overall, a point-scoring rather than a simple traversal game, though upon reaching the back rank a tower is promoted to a "sumo," thereby acquiring additional powers and a higher point-value. Sumos can be subsequently further promoted to double, triple or quadruple varieties. For me, the main feature of interest was that at each turn you must move your tower of the same colour as the square occupied by the piece just moved by your opponent. The fact that each player affects the other's next move reminded me of both Quandary and Tripples, and reawakened my interest in unfulfilled games like Mondriaan and Colorado.

Seeing Kamisado at a games fair in Germany in 2008 led me to develop Paintominoes, a colourful version of Golomb's Game of pentominoes (long one of my favourites) by designing an 8x8 board in squares of four different colours, symmetrically arranged [Fig 10]. One player chooses two colours, say red and green, leaving the other (necessarily) yellow and blue. You then each in turn place a pentomino, as in the standard game, but at end of play you score the number of squares of one of your colours left unfilled, multiplied by the number of those unfilled of your other colour. You therefore score zero if one of your colours becomes completely covered.

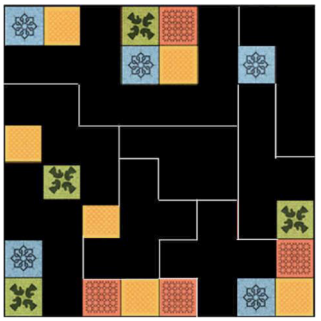


Figure 10: Paintominoes on a Katarenga board.

This proved a very playable idea with a wide range of possible final scores, but I wasn't satisfied with always playing it on the same board. So I started designing other four-colour symmetrical 8x8 boards and became quite interested in exploring the number of different possibilities. It finished up with about 12 different boards, out of potentially many more, printed on separate sheets of card, a different one of which would be slotted into a frame at start of each game. Nice idea, but still not practical enough to offer a publisher.

In 2010 I developed a game called Waterhole, a 2-to-6 player thematic derivative of my first published abstract, Shoulder to Shoulder (Intellect Games, 1975). This features a large grid of hexagons (367) in six different colours representing different types of terrain in a notional African landscape. The aim is to get all your own animals, starting scattered about the six edges, into a connected group with at least one of them adjacent to the central waterhole, without being eaten by the crocodile. To make the board variable, it is split into six 'pie slices' of equal size but different, quasi-random arrangements of terrain. These are slotted together at start of play, producing any of 120 different possible whole-boards. Waterhole goes down well (no pun intended) when I exhibit it at game designers fairs, but no one has yet cared to publish it.

A new approach

My first thought on seeing Kamisado was perhaps irrational, in that I hadn't yet read the rules, namely: 'Is it really necessary for a multi-coloured board to be symmetrically patterned? Can I revive the idea of a quasi-random arrangement without having to start by individually placing 64 or more coloured tiles on a blank grid?' The answers—respectively No and Yes—emerged from my experiments with Paintominoes and Colorado. It was to design an 8x8 whole board constructed from four different and asymmetrical quarter-boards of 4x4 each. These could be double-sided to increase the possibilities even further.

Four seemed the obvious number of colours; but, before designing the quarters, I had to consider what sort of game would be played on them. Four colours suggested four types of move, and four obvious candidates either moves of 1, 2, 3 or 4 squares, or, more interestingly, those of rook, bishop, knight and king. It was not my intention to produce a chess variant – and, strictly speaking, it isn't one—but rather they are the simplest and most obvious forms of movement on a squared grid. (I am convinced that if aliens exist intelligent enough to have invented board games they also will exhibit at least one with what we call 'chess' moves.) Never mind how I allocated the colours between them. Suffice to say that if reds were rooks I would not want more than three of them in a row, which means not more than one in each row and column of a quarter; and if yellows were bishops I similarly would not want two lying corner to corner.[7] At the same time, I wanted the apparent randomness to be tempered by some kind of discipline, if only to produce a more manageable number of possibilities to be explored.

My arbitrarily imposed discipline was that each quarter should display four different colours at the four corners and also along each of its four edges. I soon discovered that there were only four distinct ways of arranging the reds and four of arranging the yellows (2 x 2 reflections). Combining the two yielded 22 different skeletons: Fig.11

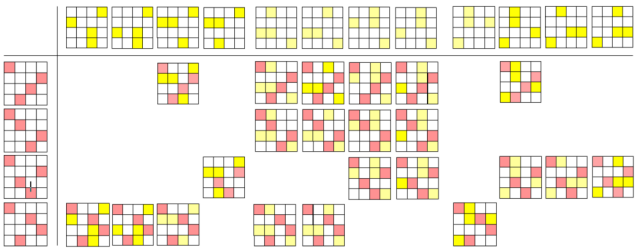


Figure 11: Possible arrangement of red and yellow squares for Katarenga.

Finally, the unfilled squares can be distributed between blue and green, for which the only constraint on colour adjacency is three orthogonally contiguous squares of the same colour. Each distinct pattern of blue-green can be mirrored into the equivalent pattern of

green-blue. Ignoring reflections and rotations, this produces 108 different and distinct quarterboards. Those I eventually chose were: Fig.12 where those in the lower row are the reverse sides, and reflections-and-or-rotations, of those in the upper. It is only since publication that I have gone to the trouble of performing an exhaustive search. If I had started with it I might have chosen differently—for example, by halving the number of those exhibiting three diagonal reds and doubling that of the asymmetrical quadrants.

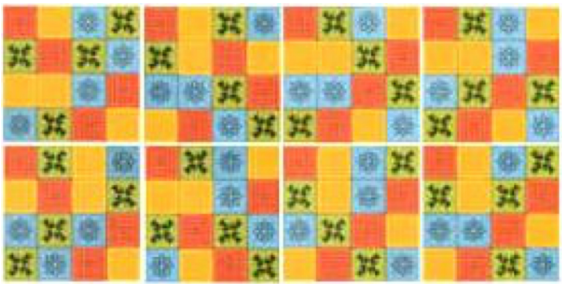


Figure 12: Katarenga quarter-boards.

There now remained only to decide on what sort of game to play and what to call it. Since I regarded it as an improved extension of Colorado I retained that colourful title and the objective of getting all your pawns to the opposite rank, where "all" meant only those remaining after capture. I perceived it not as a capturing game but as a pathfinding-and-blocking game in which it would actually be disadvantageous to capture. In this form I displayed and tested it with new players at the 2014 Board Game Studies Colloquium in Ipswich. An interesting outcome of this was that one of my opponents proved to be red-green colour-blind and often confused the hitherto plain squares of those colours. I therefore designed some grid-like markings intended to visually suggest the direction of travel. The knight-move was problematic, though, as what I first essayed were linear representations of the pathway concerned. The trouble with this was that the result was either too similar to the king-move or became too suggestive of conjoined swastikas. I finished by just using horse heads, which Huch decided to keep.

To my delight, I soon discovered that the board and rules of movement lent themselves to a variety of other games, mostly adaptations of well-known ludemes. Congress, for example, is a group-connection game derived from Shoulder to Shoulder, Troika a three-in-a-row game, and Cornered a space-restricting species of Nim played on just one of the quadrants. My favourite is Battle Stations, as it has the simplest rules possible (you each in turn place a pawn anywhere on the board, when all are down you each in turn capture any opposing pawn, and whoever is left with most on the board at end of play wins) but can call for the most mind-boggling problems of forward visualization.

Huch published some of these as 'Katarenga Extras' on their Facebook page at weekly intervals preceding Christmas 2017. These, and more, can also be seen on my website.

Publication and further development

Simon Hopp, product development manager at Huch Spiele, was enthusiastic about the mechanics of the game but not entirely happy with it as a purely pathfinding exercise. After experimenting with it in quest of something with more "bite"—the chess-player's approach—his first idea was to change the objective to getting just three pawns across the board, allowing you to use the other five (barring captures) to create combinations both in support of their own fellows and as harriers of opposing pawns. If I felt vaguely uncomfortable with this it was for the trivial reason that anything to do with three seemed out of character with the essentially fourfold nature of the rest of the game. Eventually, however, Simon discovered that the same principle worked even better by reducing the requirement from three to two.

That only left the problem of the title and visual ethos. Since the marketing aim was to play up the game's chess-like characteristics the game was retitled at first Katuranga, which immediately suggested both Chaturanga, the Indian ancestor of chess, and Kamisado, which was also published by Huch and had become well established. Despite a dozen other alternative suggestions of mine, the presumed reasoning behind Katuranga held sway, yielding only to a change of vowels to Katarenga, perhaps to prevent its sounding too much like a reincarnation of Chaturanga. The Persian kings story was invented to give it a sort of thematic background and account for the oriental design.

I was hoping to demonstrate the game at the 2018 Mind Sports Olympiad in London, in hope that it will be sufficiently well received to justify a Katarenga tournament at the 2019 event. Unfortunately a game called Colour Chess came out in the same year and got there first.

Whether or not any guidelines to strategy can be given remains to be seen. The variability of the board may necessarily make it more of a tactical than a strategic game, and it would have to be played against the clock. I have to admit that it is one of the most brain-straining games I have ever played. In fact, much as I love it, I sometimes think I have unleashed a monster. Perhaps a better title would be Frankenstein. Chess on steroids indeed! ■

Acknowledgements

For help in testing and suggesting, and general encouragement, my thanks to Graham Parlett, Frances Touch, John McLeod, Anita Landgraf, and Simon Hopp.

Notes

1 Tweet by @anna-polkowska [unavailable, as of publication]
2 Hutter Trade: http://www.hutter-trade.com/index.php/de/
3 The word has yet to be recognised by the Oxford English Dictionary. When I first used it in my Oxford History of Board Games (1999) I thought I had invented it, but it seems to be well known to Fairy Chess enthusiasts.https://sites.google.com/site/boardandpieces/terminology/hippogonal.
4 *Games & Puzzles*, #3, 4, 5
5 *Games & Puzzles*, #42
6 Wrongly but flatteringly attributed to me in Lhôte, *Histoire des Jeux de Société*, perhaps misread from my review of it in *Games & Puzzles*, #15. The game has been published under various titles (All the King's Men, Smess, etc), not all with the same arrangement of colours.
7 There is a shortage of terminology here. Can one say "diagonally adjacent"? Without further qualification adjacent seems to edge-to-edge. I would suggest something like 'appointant'. See also "Algorithms for Coloring Quad trees": https://arxiv.org/pdf/cs/9907030.pdf.

(See p. 36 for commentary.)

"That play of black upon white, white upon black, has the intent and takes the form of creative art. It has in it a flow of the spirit and a harmony of music. Everything is lost when suddenly a false note is struck, or one party in a duet suddenly launches forth on an eccentric flight of his own. A masterpiece of a game can be ruined by insensitivity to the feelings of an adversary." ~ from *The Master of Go* by Yasunari Kawabata

Edge Templates in Onyx

by Larry Back

Many years have passed since I wrote an article about Onyx. [See *AG4* for the rules of Onyx.] In fact, the last article I wrote was published in 2002. So the time has come to write another one. In this article I would like to discuss edge templates (or "templates" for short). I mentioned this topic briefly in *AG6* (under the heading "The Edge") but I have since gained some insights that I did not have at that time and I believe it is useful to cover the subject more fully now.

Onyx has some obvious similarities to both Hex and Bridg-It in that all three games are played on four-sided boards where players take turns placing a piece of their colour on an unoccupied space (or point) as they try to connect two opposite sides of the board. Therefore, before discussing templates in Onyx I believe it is helpful to first look at templates in Hex and Bridg-It in order to do a comparison.

Diagram 1a is an example of a template in Hex. The black piece is two moves away from connecting to one of the bottom four edge spaces. Even with the next move White cannot stop the black piece from connecting to the bottom edge (assuming Black plays correctly) unless White can make a move to the template with a threat that compels Black to play elsewhere. But if Black is determined to connect the black piece to the bottom edge, despite any threats White might have, then White cannot stop this. Diagram 1b shows an attempt by White to stop Black with '1' and the correct Black response with '2'.

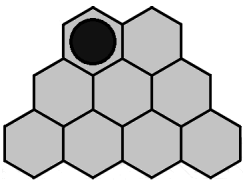


Diagram 1a

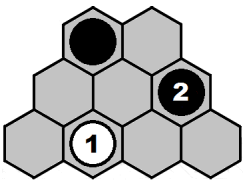


Diagram 1b

In general, an edge template is a portion of a board that includes an edge and has just one piece (black in the example) and a minimal number of empty spaces (or points) to ensure that, by only playing within the template and without the help of pieces outside the template, the piece on the template will be able to connect to the edge.

Being familiar with templates can be very useful during a game. Knowing ahead of time that a piece cannot be stopped from connecting to the edge, even a piece that has not yet been placed on the board, is very important while plotting your next move. This is true whether you are the player trying to make the connection, such as Black in the example, or you are the player trying to prevent the connection, such as White in the example.

This is just one example of a Hex template. There are other Hex templates that are bigger or smaller depending on how far a piece is from the edge. The more spaces a piece is from the edge the wider the template. But this one example serves to demonstrate the idea of a template.

When it comes to Bridg-It, though, there are no templates except for the trivial one where a piece is on the edge already. (In other words, the piece is zero moves away from connecting to the edge.) Diagram 2 shows part of a Bridg-It position where a black piece is one move away from connecting to the bottom edge but White has played '1' in order to stop the connection.

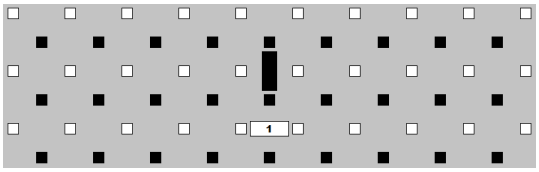


Diagram 2

No matter how wide the edge is Black will not be able to connect the black piece to the edge if there are no other black pieces already on the board to help with the connection. Diagram 3 shows two futile attempts by Black, first on the left and then on the right, to connect the black piece to the edge and the moves by White that easily refute Black's efforts.

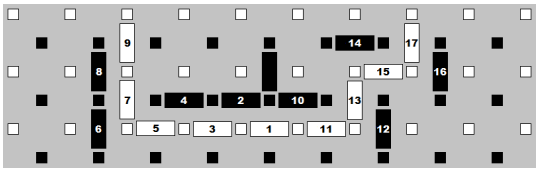


Diagram 3

Black can make a move that threatens to connect the black piece to the edge and also threatens other connections. But if White is determined to stop the black piece from connecting to the edge, regardless of other threats, then the black piece will not reach the edge. Black can still win, of course, but the winning chain will not involve the black piece if White is determined to prevent that.

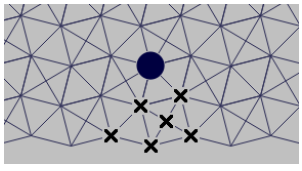


Diagram 4a

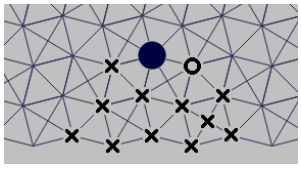


Diagram 4b

Like Hex, Onyx has templates and two of them were featured in *AG6.* These templates, where the black piece is two moves away

from connecting to the edge, are shown in Diagrams 4a and 4b. If White does not have a piece on one of the points marked 'x' then, even with the next move, White cannot stop the black piece from connecting to one of the bottom edge points.

There is a quirk, however, with the template in Diagram 4b that I did not mention in AG6. There is a point marked 'o' that is outside the template. It does not help White to have a piece on this point if White is trying to stop the black piece from connecting to the bottom edge. In fact, such a piece can be a hindrance for White. But Black will need to move to this point if White plays to the 'x' point directly below the black piece. This type of situation does not occur in Hex templates.

Aside from the 'o' point, notice that these diagrams differ from each other in another way. Diagram 4b has a much wider template than Diagram 4a. In order to explain this, it is necessary to observe that an Onyx board has two kinds of points, minor and major. The minor points are in the middle of the squares. The major points are at the corners of the squares. Also, the four points at the corners of the board, since they are not in the middle of squares, are considered to be major points as well even though they are not actually at the corner of a square.

The terms minor and major are appropriate since minor points are only connected to four other points whereas major points, with the exception of edge points, are connected to seven other points including five other major points. Given that Onyx is a connection game the extra connections of the major points make them more desirable to occupy than the minor points, at least in most cases.

Not only are there two kinds of points in Onyx but among the major points, unlike the spaces in Hex or Bridg-It, there are different orientations. A major point is oriented either South or North. To be oriented South means the point is connected to two lines that go towards the bottom edge and only one line that goes towards the top edge. (By "line" I mean the long lines that connect major points to each other, not the short lines that connect minor points to major points.) A major point is also oriented East or West. Therefore, each major point (with the exception of some edge points) has one of the following orientations: South-East, South-West, North-East, or North-West. The four major points on any one square of the Onyx board will all have a different orientation.

One way to determine a major point orientation is to look at the diagonal line that connects to the major point. This would be the line that connects the major point to another major point that is on a different square. Starting at the major point this diagonal line will either go in a South-East, South-West, North-East, or North-West direction thereby indicating the orientation of the major point. Diagram 5 shows a white piece on a major point that has a North-West orientation. The diagonal line that goes in a North-West direction is highlighted in the diagram.

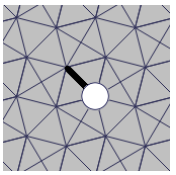


Diagram 5

If a major point is oriented North then the template to connect a piece on that point to the South edge is wider than if the major point is oriented South. The reason for this is that a South oriented point is connected to two major points that are each one move closer to the South edge whereas a North oriented point is connected to only one major point that is one move closer to the South edge. Therefore, it is easier for the opponent to stop a piece on a North oriented point from connecting to the South edge than a piece on a South oriented point. Since it is easier to stop a piece on a North oriented point from connecting to the South edge that means the template must consist of more empty points in order to ensure the connection of that piece to the South edge.

Now let us look at templates where the piece is on a major point and is only one move away from connecting to the South edge as in Diagrams 6a and 6b. Again, two examples are needed, one for a South orientation and one for a North orientation. Notice that, as with Diagram 4b, if the piece is on a North oriented point then the template is wider. Also notice that the wider template has an 'o' point with the same property as the 'o' point in Diagram 4b.

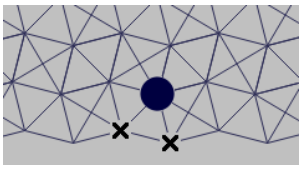


Diagram 6a

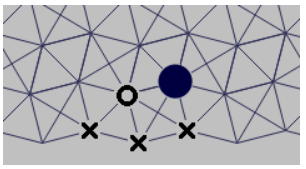


Diagram 6b

Onyx templates have another complication that Hex templates do not have. In Diagram 7a the black piece at 'A' can be stopped from connecting to the edge even though White has no pieces in the template. This is because Black has another piece at 'B' that is in the template. As Diagram 7b shows, White can now play '1' and if Black plays '2' then White can make a capture with '3'. This is an example of how, in Onyx, your own piece can hurt you. This is a characteristic that neither Hex nor Bridg-It has.

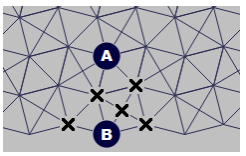


Diagram7a

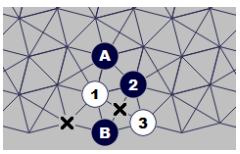


Diagram 7b

It is worth looking at another example that shows how your own piece can get in your way. But in this example it is the player trying to stop the connection whose own piece proves to be a liability. In Diagram 8a Black has a piece on a North oriented point that is two moves away from connecting to the bottom edge. White already has a piece in the template so White can play '1' (the only move that works) to stop the black piece. But in Diagram 8b there is now an additional white piece that is not actually in the template but is nonetheless beside the black piece. (This piece occupies the aforementioned 'o' point.) This extra white piece will allow Black to make a capture after White plays '1'. Hence, White's ability to stop the black piece from connecting to the bottom edge is thwarted by the extra white piece. Again, in Onyx, your own piece can sometimes be of more help to your opponent than to you.

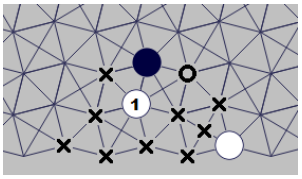


Diagram 8a

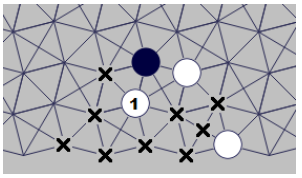


Diagram 8b

As with Hex templates, a player's piece on an Onyx template can be stopped from connecting to the edge if the opponent makes a

move to the template that threatens a connection elsewhere and the player chooses to respond to that threat. In Diagram 9a Black plays '1'. This piece has a duplex connection to the other black piece and is also on a template. But as Diagram 9b shows, White can make a move into the template with '2' that threatens to break the connection between the two black pieces. Now Black must choose to maintain the connection between the two black pieces with a move to 'A' or ensure the connection of '1' to the edge with 'B'. If Black chooses to move to 'A' then White can move to 'B' and stop the black piece at '1' from connecting to the edge.

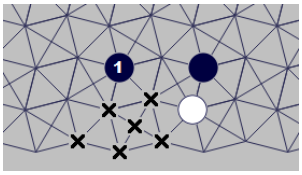


Diagram 9a

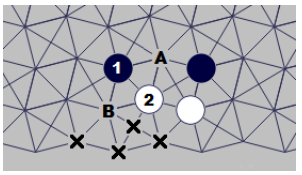


Diagram 9b

One type of template that I did not consider in *AG6* is a template where a piece is on a minor point. With minor points there is no orientation. Therefore, only one example is needed for each different distance of the minor point to the edge.

The example in Diagram 10 is quite simple. The piece is on a minor point that is one move away from connecting to the bottom edge. Only two empty points are needed in this template.

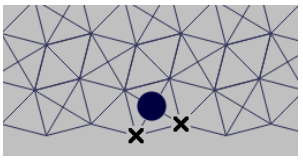


Diagram 10

Diagram 11a shows that there really is no template when a piece is on a minor point that is two moves away from the edge. White can play '1' (the only move that works) in order to prevent the black piece from connecting to the bottom edge. The fact that there is no template in this situation is an example of how moves to minor points are generally weak compared to moves to major points. I mentioned this in AG6. Since a minor point has fewer connections than a major point the minor point move should generally not be played except in a "Stand Off" or "Long Diamond" formation. I rarely find exceptions to this strategy rule. However, there is one exception to this template (or lack of template really) as shown in Diagram 11b. The presence of the white piece actually stymies White's ability to stop the black piece from connecting to the bottom edge. Now the White move to '1' would be followed by a Black move to '2' and an unstoppable connection to the edge. This is yet another example in Onyx where your own piece can be an impediment.

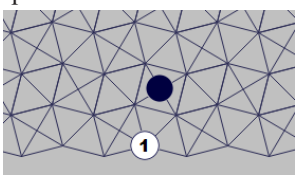


Diagram 11a

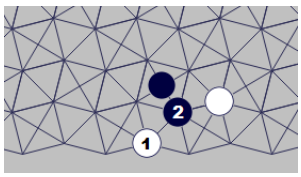


Diagram 11b

Although there is no regular template for a piece on a minor point that is two moves away from the edge there is a special template for a position where such a piece has a helper in the form of a nearby opponent's piece as in Diagram 11b. Since this type of situation can and does occur in actual games it is valuable to see what this special template looks like. Diagram 12 shows the template. With the extra white piece contributing to Black's ability to connect to the edge White will need yet another piece on one of the points marked 'x', as well as the next move, in order to stop the black piece. (Again, for the purposes of connecting the black piece to the edge, Black may end up needing to move to the 'o' point but it does not help White to have a piece on this point.)

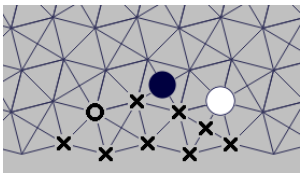


Diagram 12

Given the absence of a template (a regular one anyway) for a piece on a minor point that is two moves away from the edge it is not surprising that there is no template for a piece on a minor point that is three moves away from the edge. Such a piece can always be stopped from connecting to the edge if there are no other pieces of the same colour to help with the connection. This is true even if, as in Diagram 12, the defender has a piece nearby that might be of help to the player trying to make the connection. Diagram 13a shows a black piece on a minor point that is three moves away from the edge. White's move '1' easily stops Black. But in Diagram 13b White has an extra piece. Now if White tries the same move '1' as in Diagram 13a Black would play between the two white pieces. Then White would not be able to stop the black piece from connecting to the edge. But as Diagram 13b shows, White can still stop Black with a different move '1'. (This move works in Diagram 13a too.) After '1' White must respond carefully to Black's moves but, ultimately, White can stop the black piece from connecting to the edge.

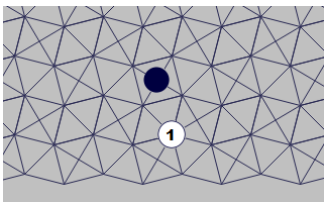


Diagram 13a

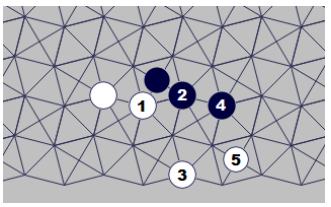


Diagram 13b

Finally, we must consider the template for a major point that is three moves away from the edge. Back in 2002 I had not determined what such a template would be. I had assumed that such a template existed but I figured it would be very wide and complicated. But, recently, it dawned on me that there is no template for a piece on a major point that is three moves away from the edge. The reason for this seems to be that if the piece is three moves away from the edge then the opponent has room to set up an Opposition Long Diamond. As discussed in *AG6* the Opposition Long Diamond (or Long Diamond Defence as I sometimes call it) is a very useful defensive move to stop your opponent's progress.

Before looking at White's use of the Long Diamond defence to stop Black it is instructive to see what happens when White tries a different move. In Diagram 14 White makes the move '1' in an attempt to stop the black piece from connecting to the edge. But, as we will see, this move does not work.

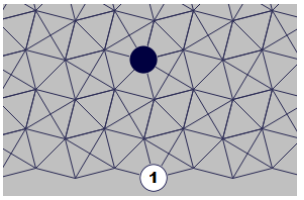


Diagram 14

In Diagram 15a Black plays '2' and creates a Long Diamond connection. This move, however, is refuted by White's move to the minor point with '3'. The continuation shows that White is able to stop Black. Diagram 15b, however, shows Black's correct response to '1' with '2'. Now White must play to one of the three 'x' points on the triangle between the three pieces. But Black has an answer to each of these three moves.

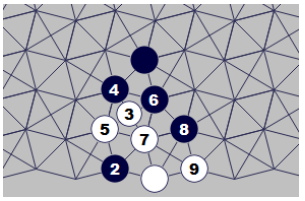


Diagram 15a

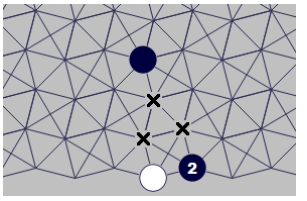


Diagram 15b

Diagram 16a shows one of White's three responses to the Black move '2'. White plays '3' and Black responds with '4'. Now White must play '5' and allow Black to make a capture with '6'. In Diagram 16b White replaces the captured piece at '5' with '7' and threatens a counter-capture on two squares. (By the way, if your opponent has made a capture and you can immediately make a capture yourself in response, a good rule-of-thumb in Onyx is to replace one of your captured pieces first. This way you threaten a capture on two squares and your opponent can only defend against one of the captures. Experience has taught me this is usually the best move.)

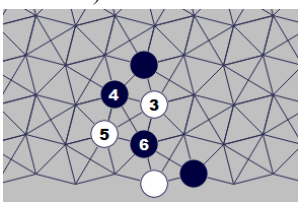


Diagram 16a

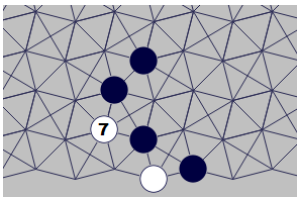


Diagram 16b

After the White move '7' Black plays '8' and White captures with '9' as shown in Diagram 17a. But then Black replaces one of the captured pieces with '10' as shown in Diagram 17b. Now Black has two threats to connect to the edge. White can only stop one of those threats so Black will connect to the edge.

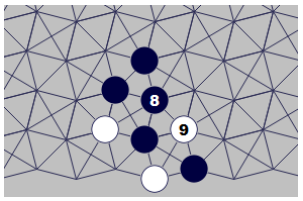


Diagram 17a

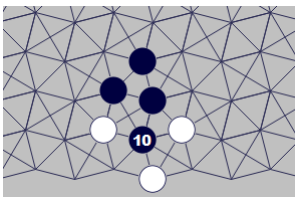


Diagram 17b

Diagram 18 shows another possible White response with '3' and the correct reply for Black with '4'. Now Black will connect to the edge.

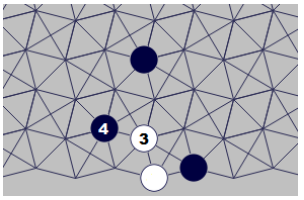


Diagram 18

The last of White's three options is shown in Diagram 19a. After '3' Black can make a capture with '4' but, interestingly, this is not the right move. White can answer Black's capturing move with '5' and prevent the black piece from connecting to the edge as shown in Diagram 19b.

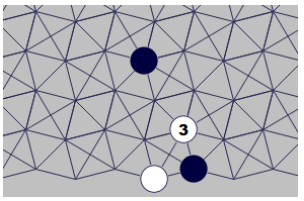


Diagram19a

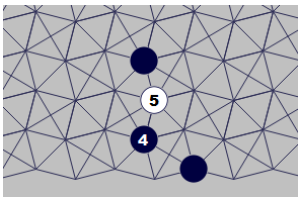


Diagram 19b

Diagram 20 shows Black's proper response with '4'. Instead of making a capture Black moves to the minor point. Now White must defend against the capture threat with '5' but then Black's move '6' ensures that Black reaches the edge.

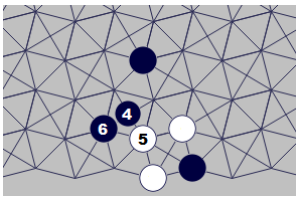


Diagram 20

Having looked at a move that does not work for White, and Black's correct response, we can now look at a move for White that does succeed in stopping Black. Diagram 21 shows an attempt by Black to connect a black piece to the bottom edge on a large board from a South oriented major point that is three moves away from the edge. White uses the Long Diamond defence with '1' to stop the black piece. Black tries to connect on the left side but with correct play by White the black piece cannot connect to the edge.

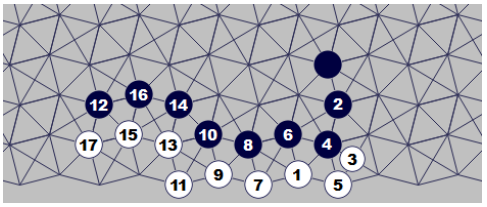


Diagram 21

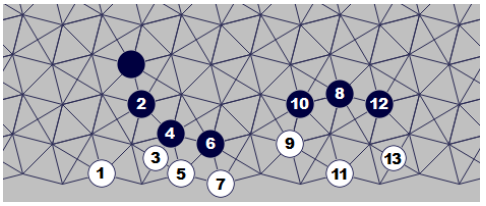


Diagram 22

Diagram 22 is an example of an attempt by Black to connect on the

right side this time. Again, White is able to stop Black.

Diagram 23 is an example of a different attempt by Black to connect on the right side that actually succeeds after Black's move '12' to a template. However, a different move '5' by White would have stopped Black.

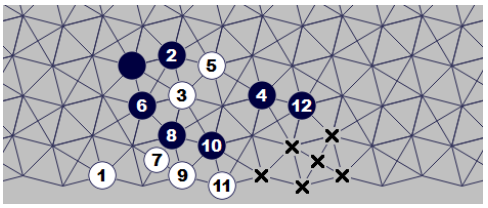


Diagram 23

Diagram 24 shows the continuation after White makes the correct reply to '4' with '5'. Now White is able to stop Black.

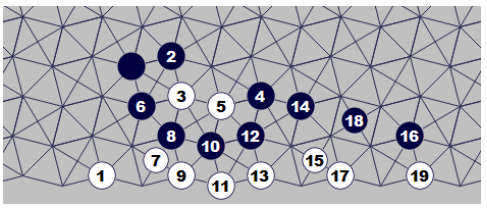


Diagram 24

Diagram 25 is an example where the black piece is on a North oriented major point that is three moves away from the bottom edge. Since the black piece is on a North oriented point White can play directly below the black piece with '1'. Then after Black plays '2' White can use the Long Diamond defence with '3'. Now the position is the same after White's move '3' in Diagram 24. Again, White can stop the black piece from connecting to the edge.

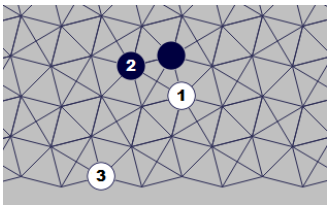


Diagram 25

Diagram 26 shows one last example where the black piece is on a North oriented major point that is three moves away from the bottom edge. This time White employs a "Chimney" maneuver with '3' (see description of "Chimney formation" in AG11) to stop Black from connecting to the bottom edge.

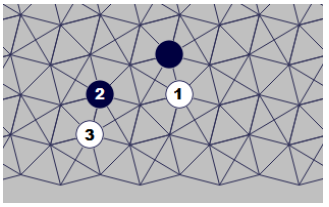


Diagram 26

Having shown that there is no template in Onyx for a piece that is three moves away from the edge we can conclude that Onyx is a little like Hex and a little like Bridg-It when it comes to templates.

Like Hex, Onyx has templates. Like Bridg-It, there is no template once a piece is a certain distance (one move for Bridg-It and three moves for Onyx) from the edge.

Knowing that there is no template when a piece is three moves away from the edge, and knowing how to stop that piece from connecting to the edge, can be very useful when determining your best move in Onyx. In Diagram 27, with White to play, Black cannot be stopped from connecting to the North edge since Black has not just one but two pieces on templates there. So not only is Black's connection to the North edge assured but White would need more than one move in that area before Black would be required to respond. Therefore, White must focus on stopping Black from connecting to the South edge. Black has two threats. One threat is to break through the middle with a move to 'A'. The other threat is to connect to the edge in the bottom right corner with a move to 'D'. White can stop a black piece at 'A' (since it is three moves away from the edge) but if Black plays to 'D' then Black will connect to the edge. So White must contend with Black's threat to connect at 'D'. There are actually five moves ('B', 'C', 'D', 'E', 'F') that accomplish this. But, as we will see, only one of these moves wins for White.

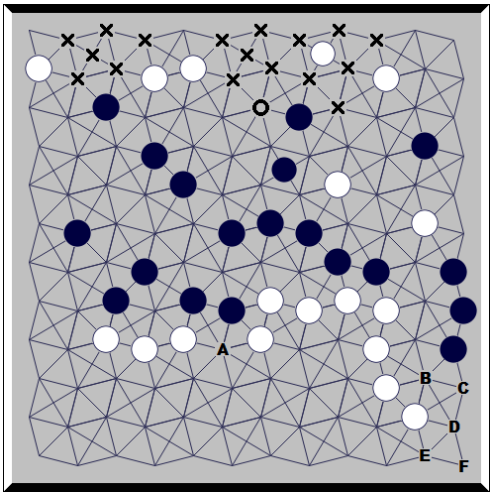


Diagram 27

Before looking at White's winning move let us look at one of the losing moves in Diagram 28 and the sequence along the bottom of the board that would ensue.

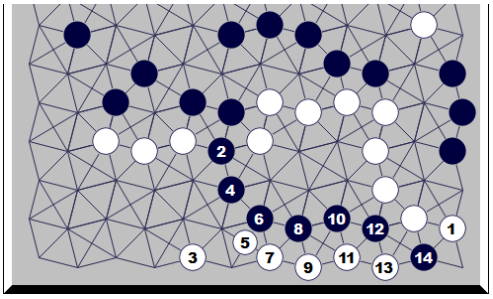


Diagram 28

Black is able to connect to the bottom edge after making a capture with '14'. The point occupied by '14' is where White should have played to begin with instead of '1'. So, it turns out that 'E' in Diagram 27 was White's only winning move. A move to 'E' would have prevented Black's connection in the bottom right corner and also stopped the black piece at '2' from connecting to the edge.

Now let us look at a sequence after White makes the correct

move in Diagram 29. Black tries to connect '2' to the bottom edge on the right side but is unable to do so. The position is tricky after the Black move '10'. Now White must choose between moves 'A' and 'B'. A White move to 'A' loses. Black would play at 'B' and White would be forced to play at 'C' but then Black would capture at 'D'. Now Black would connect to the edge by either linking the pieces at '10' and '8' or linking the pieces at '10' and 'E'. (Yes, the piece at 'E' would be back in play!) The correct move for White is to play to 'B'. This forces Black to play to 'A' and then White makes a capture at 'C'. It is still complicated but if White plays correctly then Black is not able to break through.

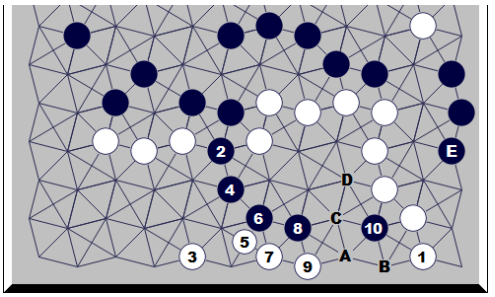


Diagram 29

Black can also try to connect on the left side. The following sequence in Diagram 30 shows that Black makes a valiant effort but White is nonetheless able to stop Black after move '15' connects to a white piece on a template.

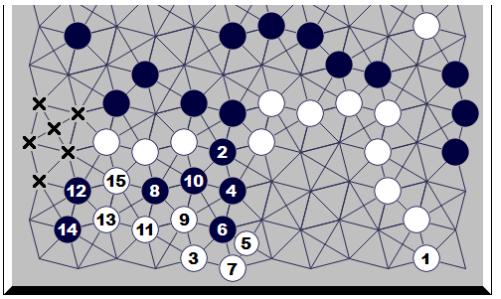


Diagram 30

One last try by Black is to play '4' as shown in Diagram 31. But White can answer with '5'. This prompts Black to play '6' followed by a White move '7'. The continuation is complicated after that but, with correct play by White, Black will not be able to connect to the bottom edge.

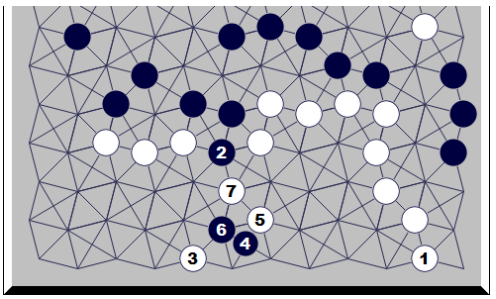


Diagram 31

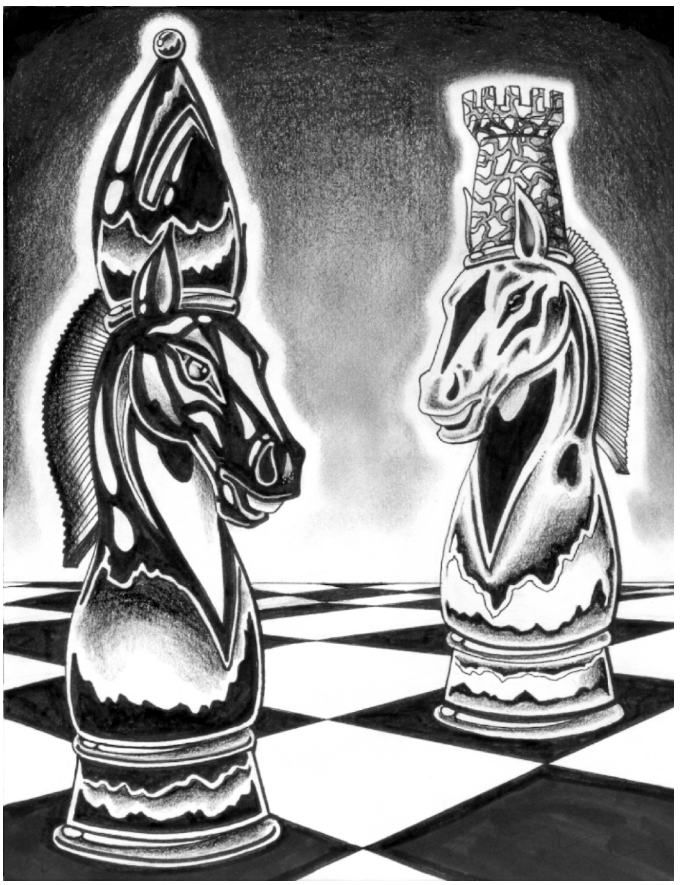
That would seem to cover the subject of Onyx edge templates, at least as much as I know about them. I should mention that Onyx can now be played at the Gorrion Online Game Server. There is an option to play on a big 16x16 board as well as the original 12x12 board. I have enjoyed playing on the 16x16 board but the 12x12 board still presents a challenge. Both the empty board starting position and side pieces (or "Head Start") starting position can be chosen. I still prefer the "Head Start" starting position but enjoy the empty board starting position too. I will accept any challenges. I have deviously chosen the user name "larry_back". ■

Gorrion: http://www.dashstofsk.net/gorrion.php?op=ag

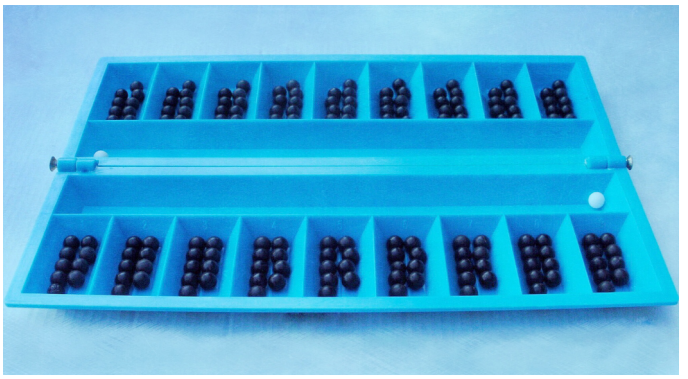
Larry Back was inspired by an article about Pente to start inventing games in 1982. Aside from Onyx, Larry's other published games are Three Crowns (AG8), 77 (AG10), Diamond, and Lynxo. Before trying his hand at game inventing Larry was an avid Chess player but later turned his attention to Othello and represented Canada at four World Othello Championships.

Larry was an important contributor to the original series of Abstract Games*. As mentioned above, he had articles on Onyx in AG4, AG6, and AG11. In addition to the articles on his other games, Three Crowns and 77, Larry contributed pieces on Othello (AG9) and Domain (AG12).*

As Larry demonstrates in all of his Onyx articles, the tactics of Onyx are fascinating. In particular, the fact that one's own pieces can be a liability, and opponent's pieces can be used to make connections, leads to subtle and interesting positions. Moreover, Onyx seems to fit with David Parlett's game Katarenga (p. 24). The Onyx pieces are uniform, but the significance of individual pieces can depend on board geometry. Likewise, the pieces in Katarenga are uniform but they inherit their powers from the spaces they stand on. Both games, in other words, are games of unequal board spaces. ~Ed.



Grand Chess Cardinal and Marshall, by Daniel Bauer, which headed all the Grand Chess articles in the original series.



Тоғызқұмалақ

(Toguz Kumalak)

The Mindsport of Central Asian Peoples

by Ralf Gering

Toguz Kumalak (тоғыз құмалақ - Kazakh for "sheep droppings"), also known as Toguz Korgool (тогуз коргоол; same meaning) in Kyrgyz, is widely played in Central Asia. It is one of the few mancala games in which pits can be captured and turned into accumulation holes, a distinctive feature that adds another layer of strategic complexity. Toguz Kumalak has become a major mindsport that is officially promoted by the governments of Kazakhstan and Kyrgyztan. See the Timeline on the next page.

Numerous tournaments have been held in other Asian countries, for example China, Mongolia, Pakistan and Uzbekistan, and also in Russia (Altai Republic, Omsk, Yakutsk, Tatarstan). In Europe, tournaments are organized every year in the Czech Republic (Pardubice, Praha), France (Cannes), Germany (Schweinfurt), Poland (Poznań), Switzerland (Fribourg), and Turkey (Istanbul). Smaller tournaments were also reported from England, Lithuania, North Macedonia, Romania, Portugal, and Spain.

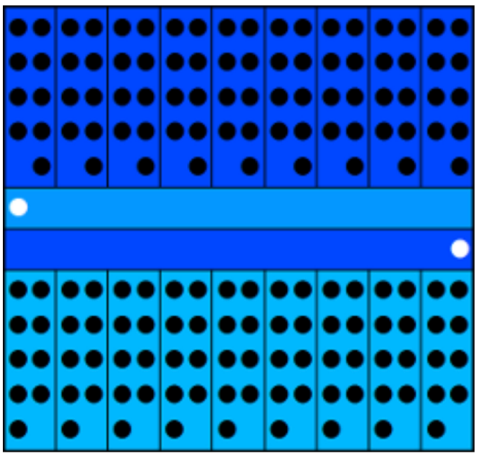
Rules

The game is played on a board, which consists of two rows of nine oblong holes *(otau,* literally, "yurt") and two parallel furrows *(kazan,* literally, "kettle") between them. The *kazan* serve as stores for captured balls. Initially, there are 9 little black balls *(kumalak)* in each hole. The holes are made in such a way that the two players can easily distinguish between an odd and an even number of balls. In addition, each player has a larger ball in a different color (usually white) that serves as a marker for any *tuzdik* the player might make later (see below). The players sit opposite each other, on the long sides of the board, directly in front of their holes. A player's *kazan,* however, is adjacent to the opponent's row. The player who starts the game is called "White", the other player "Black".

At his turn, a player takes with his index and middle finger all the balls of one of his holes, except one ball that is left in the hole, and distributes them, one by one, into the following holes in an anticlockwise direction around the board. If a hole contains only one ball, it is put into the next hole.

If the last ball thus sown makes the contents of an opponent's hole even, its contents are captured. They are shifted with the index and the middle finger into the player's *kazan.* Note that the opening move of each game captures 10 balls except move 19 (see notation), which is for that reason a bad move.

If the last ball falls into an opponent's hole that has two balls (then numbering three balls), this hole is turned into a *tuzdik* (literally, "salty") and marked with a special ball. During the game any balls, which fall into a *tuzdik,* are won by the player who owns the *tuzdik,* and are then transferred into this player's *kazan.* A *tuzdik* is never skipped. Therefore, a *tuzdik* is an acquired accumulation hole, quite similar to the *lubang rumah* in Congkak or the kalah in the game of Kalah (usually known as "mancala" in the USA), except that in these games the accumulation holes are fixed from the beginning.



Toguz Kumalak starting position. White is light blue; Black is dark blue.

There are some restrictions in regard to the *tuzdik:*

- Each player can create a *tuzdik* only once in a game. Players are permitted to make more moves that end in enemy holes containing two balls, but they will not turn them into *tuzdik*'s.
- The ninth hole of the opponent cannot be turned into a *tuzdik,* only holes 1-8.
- A hole becomes immune from being turned into a *tuzdik,* when the corresponding hole of the opponent has already become a *tuzdik.* For instance, if your opponent has created his *tuzdik* in YOUR second hole, you are no longer able to make a *tuzdik* in HIS second hole.

The players move alternately and passing is prohibited. The game is finished when a player, on his turn, cannot make a move. In Kazakh this is called *atsis kalu* (literally, "left without a horse"). A player owns the balls he captured, the balls which fell into his *tuzdik,* and those that are still in his holes. The player with 82 balls or more wins. If both players have 81 balls, the game is a draw. In practical play, the game ends as soon as one player has secured the minimum number of balls needed to win, and the remaining moves are not played out.

Game clocks are used in all important Toguz Kumalak tournaments. In world championships the thinking time is up to

three hours for each player. In blitz tournaments, however, players may be given as little as seven minutes. When a player's time has expired, the balls that have not been captured yet are awarded to his opponent.

Official notation

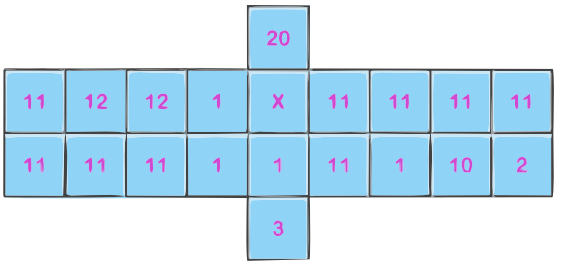
Toguz Kumalak is the only mancala variant with an official notation to record the moves made in a game. Each hole in a player's row is given a number from 1 (left) to 9 (right). The notation of a move consists of two numbers: The first number denotes the hole where the move begins; the second number denotes the hole where the last ball is dropped. An "X" means that a *tuzdik* is created. If a player scores points by capturing balls by his move, his total score so far in the game, including the new captures, is provided in round brackets. Question marks denote weak moves; exclamation marks denote strong moves. For example, 5. ... 81X(13)! means that Black started his move from his penultimate hole and finished it in the first hole of his opponent turning it into a *tuzdik;* Black made a capture, and his score has increased to13; this was a good move.

Opening

There are seven opening moves that lead to an even game: 21(10), 32(10), 43(10), 54(10), 65(10), 76(10) and 86(10). On the other hand, 19 and 98(10) are bad moves resulting in an immediate disadvantage. The diagrams on page 36show frequent 21(10) and 32(10) opening lines played by Toguz Kumalak masters (Source: *Deutscher Togus Kumalak Rundbrief*).

Middle Game

There are three types of middle games. The most common develops when both players get a *tuzdik* in the opening. Another type occurs, when no player creates a *tuzdik,* which is rather unusual. An exceptionally exciting middle game results, when one player makes a *tuzdik,* while his opponent has captured more balls. This situation becomes a fight between a positional and a material advantage. The material advantage is constantly shrinking and so the game turns into a race. Who will be the first player to cross the magic number of 81 balls, which divides victory and defeat? Also keep in mind that a *tuzdik* can be created in 8 different holes and that two *tuzdik* can be located in 56 different ways. Each of these possibilities give a different flavour to the particular game.



Ralf Gering (White) has just made a tuzdik with 55(3). He won after another 48 moves despite being behind by 17 balls.

Timeline

• 8th century: Some researchers such as the ethnologist Assia Popova believe that mancala games reached Central Asia by the Silk Road and/or through the spread of Islam.

• 12th century: Turkish people migrated from Central Asia to Anatolia. They already knew a mancala game, which appears to be a precursor of Toguz Kumalak. The game is called Piç ("bastard", "illegitimate child") and is still played in the village of Oguzkent near Erzurum (Turkey). It shares with Toguz Kumalak the same rules for capturing counters and pits.

• c. 1500 or earlier: A petroglyph (cup marks carved in a rock known as the "Toguz Kumalak rock") seems to be the first archaeological evidence for some kind of mancala being played in Central Asia.

• 18th century: *The Epic of Manas*, an account of Kyrgyztan's national hero Manas, mentions Toguz Korgool. Note that the first manuscript is dated 1792-3, although many Kyrgyz people claim the epic to be from 995.

• 1887: The Russian geographer and botanist Andrei Krasnov mentions the game for the first time in his essay "Ocherk byta semirechenskih kirgiz".

• 1903: The Asiologist György Almásy (Austro-Hungarian Empire) describes the game for the first time outside of Central Asia in his study *Vándor-utam Ázsia szívébe*.

• before 1904: Abai Qunanbaiuly (1845-1904), one of Kazakhstan's most influential poets, composers, and philosophers, was an ardent Toguz Kumalak player. His board is displayed in the Abai House Museum located in his former residence in the Zhidebay District.

• 1906: Nikolai Nikolaevich Pantusov (Russia) describes the game in his work "Kirgiskaya Igra Toguz Kumalak".

• 1911: First description in German by the ethnologist and otorhinolaryngolist Richard Karutz (German Empire) in his travelers' account *Unter Kirgisen und Turkmenen*.

• 1936: The first book on Toguz Kumalak is published in Almaty (Soviet Union).

• 1948: The first Toguz Kumalak tournament was held in Almaty. It had just four players. The tournament was won by Shorman Ortegenov from Zhambyl.

• 1949: The rules were unified by Muchtar Avezov, Sh. Ibrayev, Kalibek Kuanishbayev, and others. Before that, numerous variants existed.

• 1974: The first official Kazakhstan National Championship was held.

• 1977: André Delediqc (France) and Assia Popova (originally from Bulgaria) describe the rules for the first time in French in their book *Wari et Solo: le Jeu de Calculs Africain*.

• 1984: Heinz Machatscheck (German Democratic Republic) gives the rules and an annotated master game in his book *Stein um Stein: Exotik der Brettspiele*.

• 1992: Irina Nold became the first Kazakhstan Women's Toguz Kumalak Champion who was not of Kazakh ethnicity. Since 2004, she has lived in Frankfurt am Main (Germany). Together with her father Jurij she is still one of the strongest non-indigenous players.

• 1999: Larry Russ (USA) describes the game for the first time in English in *The Complete Mancala Games Book: How to Play the World's Oldest Board Games*.

• 2002: The first computer program was published by the Kyrgyz Information Center "Toktom" in Bishkek.

• 2003: The Kyrgyz Toguz Korgool Federation was created.

• 2004: The Toguz Kumalak Federation of Kazakhstan was formed.

• 2006: The first tournament outside of Central Asia was held at the Mindsports Olympiad (MSO) in London (England). Later on many more tournaments followed in Europe and Toguz Kumalak groups emerged in the Czech Republic (Praha), Germany (Augsburg, Schweinfurt), Poland (Poznań) and Turkey (Istanbul).

• 2008: The World Toguz Kumalak Federation was started.

• 2009: Toguz Kumalak was implemented at igGameCenter by Arty Sandler (Canada). With 316,541 games played and 19,808 players (as of August 9, 2019) it is the most popular game on this site.

• 2010: The first World Championship was held in Astana (now: Nur Sultan), Kazakhstan, with 14 nations participating. The first Toguz Kumalak World Champions were Asel Dalieva (women) and Galymcan Temirbayev (men); the best European player was Jurij Nold (Germany). Since then, four more world championships followed in the Czech Republic (2012), Kazakhstan (2015 & 2017), and Turkey (2019).

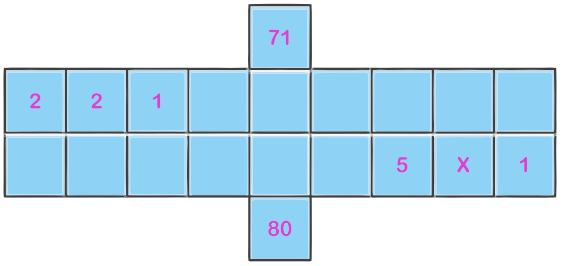
• 2011: First European Championship in Pardubice (Czech Republic). More EC's followed in the Czech Republic (2014), Germany (2016), and France (2018).

• 2014: Toguz Kumalak became a discipline of the World Nomad Games, which was held several times in Cholpon-Ata (Kyrgyztan), and, in 2019, near Riyadh (Saudi Arabia).

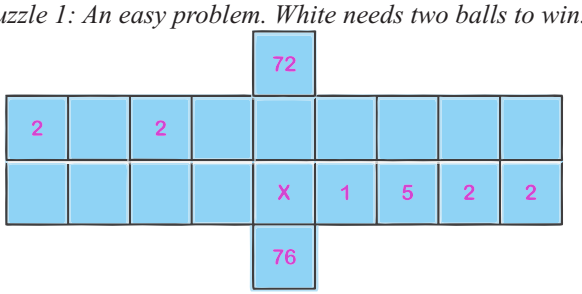
• 2019: First Toguz Kumalak tournament in South America. It was organized in Cali (Colombia) by the Fundación

Endgame

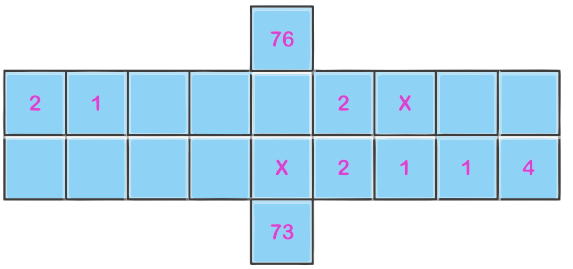
The endgame begins, when expert players are able to predict the end of the game. The most important skills are counting tempi and the knowledge of special endgame techniques by which you can capture the balls necessary to avoid defeat. Solutions of the endgame puzzles below are given overleaf. ■



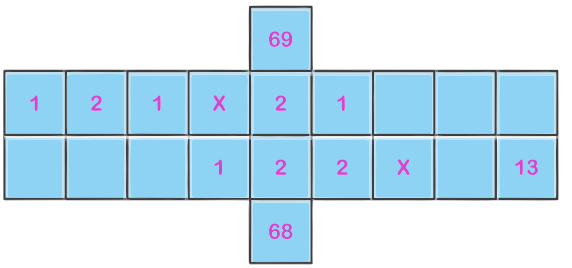
Puzzle 1: An easy problem. White needs two balls to win.



Puzzle 2: White needs 5 balls to avoid defeat. White to draw!



Puzzle 3: White has 9 tempi, whereas Black has 11. White, however, can win by increasing his tempi!



Puzzle 4: Each player has 9 tempi. Nonetheless, White can win by increasing his tempi!

Ralf Gering studied Culture and Religion at Tübingen University, Germany. Later he worked as a journalist. Ralf learned Toguz Kumalak in 2004. He won Silver in the main tournament of the 1st German Toguz Kumalak Championship in Schweinfurt (2011), Silver in the Blitz tournament of the 1st Richard-Karutz-Tournament in Sinzig (2013) and Bronze in the Blitz tournament of the 3rd European Championship in Schweinfurt (2016). He was a member of the German National Team in the 2nd Toguz Kumalak World Championship in Pardubice, Czech Republic (2012). Ralf wrote articles previously on traditional mancala variants: Vai lung thlân (AG12), Ot-tjin (AG14), Selus and Sadéqa (AG16).

References

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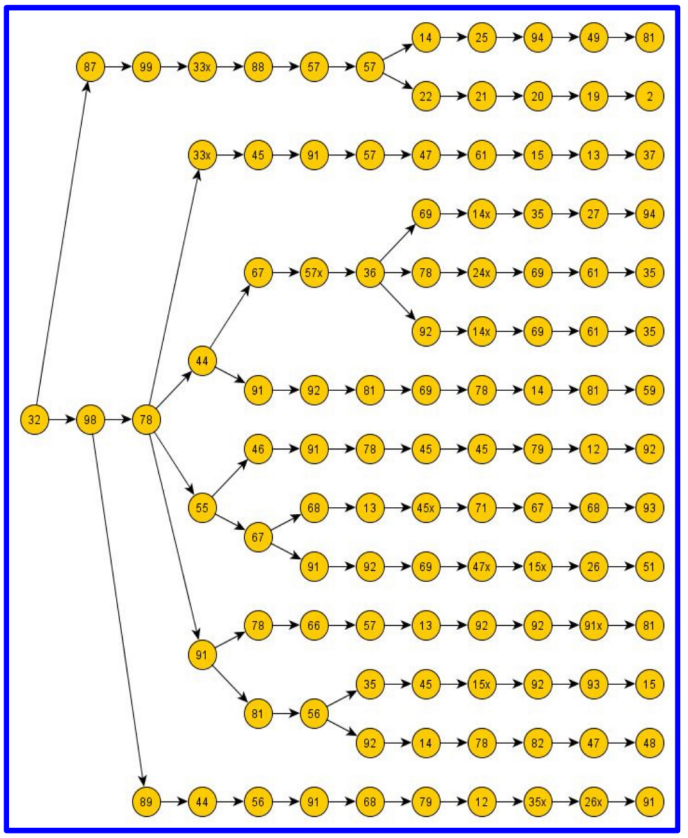
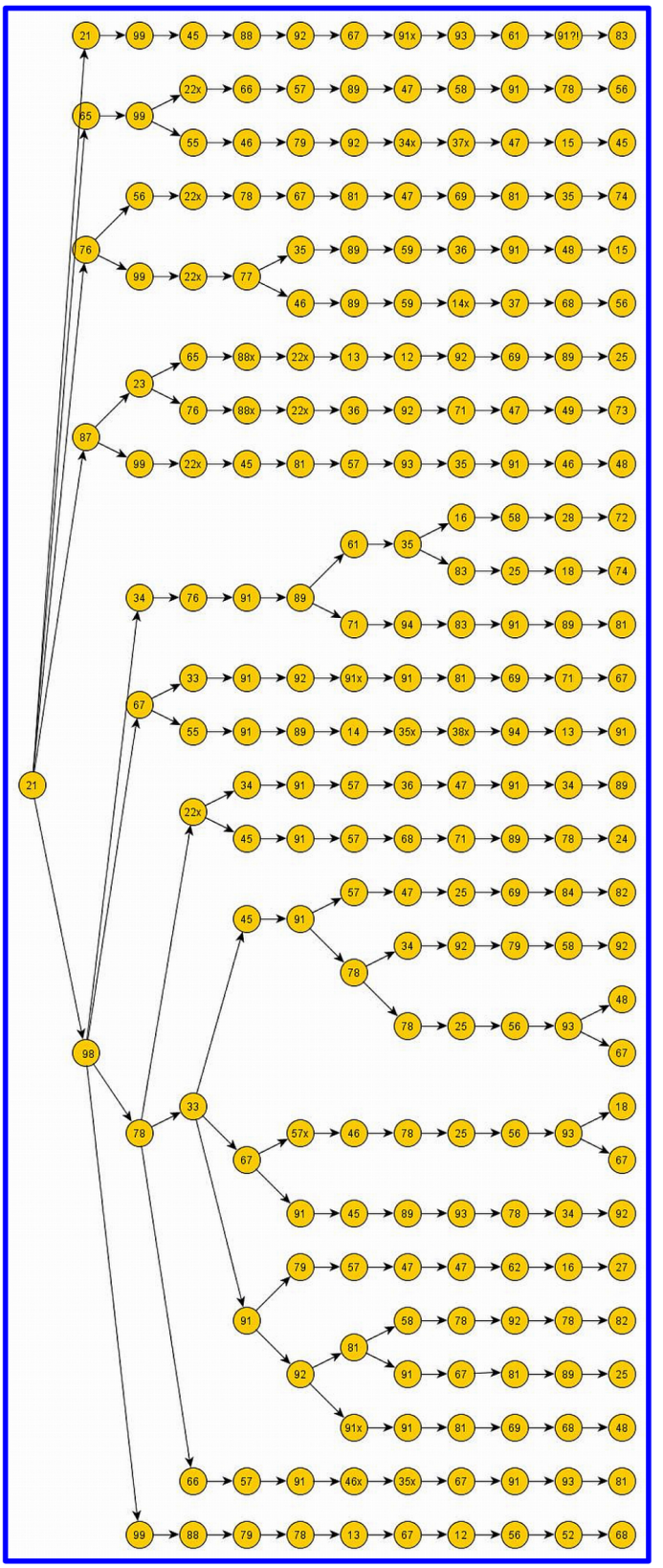
The Mad Hatter by Daniel Bauer, from "Alice Chess" (AG8).

(Continued from p. 26.)

David Parlett is the renowned author of a great many games and books about games. His game Hare & Tortoise won the 1979 Spiel des Jahres, and it is a classic, one of the earliest in the sub-genre of race games without luck. His books The Oxford Dictionary of Card Games, The Oxford History of Board Games, Original Card Games*, and many others are an important contribution to gaming literature. I have known of David Parlett since the 1970s, when he was Consultant Editor for* Games & Puzzles*. It is an honour to publish this article by David about the development of his game Katarenga.*

The significance of Katarenga is that it is an abstract game in which the board can vary and in which the board spaces differ and can affect the activity of the pieces standing on them. The variability of the board reminds me of the variability of terrain in traditional figure wargaming. You set out the terrain features initially, over which the troops will manoeuvre. Troops occupying forest or marsh, for example, will have their movement and combat modified accordingly. We are proposing an Unequal Board Spaces Game Design Competition. In other words, the games have boards in which the effect of the spaces on the pieces is variable. Examples are Katarenga, Quandary, and the others that David discusses in the article. However, there may be other ways entirely of interpreting the meaning of "terrain" for abstract games. ~ Ed.





Toguz Kumalak Puzzle Solutions, from p. 35:
Puzzle 1: 1. 91 89, 2. 72 12, 3. 91(82)
Puzzle 2: 1. 67 78, 2. 73 23, 3. 78 12, 4. 82(78) 12, 5. 93X(81) 12
Puzzle 3:1. 89 89, 2. 78 45, 3. 94(76) 12, 4. 89 56, 5. 67 67
White wins because he has 5 tempi now, whereas Black has just 4 tempi. The solution takes 23 plies in all.
Puzzle 4: 1. 56 45, 2. 45 57, 3. 68 89, 4. 89 78, 5. 56 89, 6. 56 78, 7. 68 89, 8. 89 89, 9. 67 56, 10. 95 (71)
After this move each player has 20 tempi, so White wins. In all, the solution of this puzzle is 63 plies long.

Hive PLM
Basic opening principles

by Francesco Salerno

Hive is a rather modern abstract game (only 18 years old) but has already undergone a few substantial changes in the form of new expansions. In 2013 the last new piece, the Pillbug, was introduced. The Pillbug was not developed for marketing reasons, but in an attempt to improve the gameplay. In abstracts where each piece has a specific function or movement, once the core rules are established, it is tempting to increase the complexity of the game, virtually without limits, just by "adding new friends to the party." However, as you might know from experience, a party with too many "wild animals" can be ruined sometimes. Returning to Hive, why was it necessary to add a third expansion, after the Mosquito and the Ladybug? With its mimicking ability, the Mosquito raised the strategic level, and the Ladybug, able to jump in a more controlled way than the Grasshopper, has given more strength to the attack. Although several defensive ideas already existed in Hive, many players claimed that the first player (White) advantage was not easy to bridge. Although there were not precise statistics, there was a feeling that the game was still missing something. A bug with mainly defensive character finally came, in the form of the Pillbug. Not only does the Pillbug allow your Queen to move to a safer place when in danger, but the interaction with the Mosquito has led the game to an upper level of complexity, without sacrificing its original nature. Even though basic Hive remains of course very enjoyable, since the introduction of the Pillbug there has been a consensus among players that the most challenging and balanced version must contain all three expansion bugs—the so-called Hive PLM.

In the following article I will show the basic principles of the opening phase, considering especially the expansion bugs. Hive PLM is quite different from standard Hive, and the concepts shown below need to be carefully adapted if you use a different combination of expansions—although I would always suggest playing Hive PLM, as it is the most complex to handle, but also the most balanced and exciting!

Most of the ideas presented here are not original, but are owed to one of the first theoreticians of Hive, Randy Ingersoll. His book *Play Hive like a Champion* is a best seller and the most effective way at the moment to take your skills and enjoyment of the game to a superior level. I tried to re-elaborate these ideas together with my experience in order to make the concepts as clear as possible. I really have to thank also the online Hive community, an impressive number of people scattered around the globe, united by passion for this game! The community helped me to improve my skills immensely and, importantly, find new friends and have fun.

I hope you will have fun too and bee ready for the battle! (I apologise for the terrible but inevitable pun.)

Hive notation

In the next sections, I assume the reader already knows core rules, such as the One Hive Rule, the Freedom to Move Rule, and so on, as well as the movement rules for each piece, available on the Hive website. The notation system used to describe the moves here is currently employed on Boardspace.net and Board Game Arena (see references). From now on, I will also use hex as abbreviation of hexagon.

- w: White
- b: Black
- Q: Queen
- A: Ant
- S: Spider
- G: Grasshopper
- B: Beetle
- M: Mosquito
- L: Ladybug
- P: Pillbug

- Each semi-move (one move for White or for Black) is made up of two parts.
- Firstly, there is the moving piece. For example, wL stands for White Ladybug, and bG2 stands for Black Grasshopper 2—note that bugs with multiple copies are numbered by the order that they come into play.
- Secondly, the moving piece is followed by the notation of the hex to which that piece is moving. To indicate this, a reference bug next to the destination hex must be specified.
- The hexagonal pieces are assumed to be pointing north and south, as in the diagrams. From due east clockwise, the six directions are X-, X\, /X, -X, \X, X/. For example, wA1 bQ/ means, White Ant 1 moves to the hex north-east to the Black Queen.
- Pillbug and Beetle movements have special notations. The Pillbug that executes the move is included before the moved pieces. For example, wP:bB1 -wP means, the White Pillbug is moving Black Beetle 1 into the hex west of the Pillbug itself. For Beetle movement on top of the Hive, there is no need to choose a reference hex as the destination hexagon is directly indicated by the top piece occupying it. For example, bB1 wQ means, Black Beetle 1 moves on top of the White Queen.

Opening principles

Randy Ingersoll, in his wonderful book *Play Hive like a Champion* (see references), has defined three concepts every Hive player should be well aware of:

- *Mobility:* the number of your bugs able to move, in other

words, not pinned. Generally, mobility is very important for Ants and Mosquitoes.

- *Tempo:* the number of moves you or your opponent needs to achieve a certain task. Normally, you will have to count how many moves you need to surround your opponent's Queen and compare it with the number of moves your opponent needs to surround yours. Of course, things are often not so easy, but *keeping the count* is always crucial.
- *Strength* (or Material): the number of mobile or potentially mobile bugs, including bugs in your reserve, you are able to use to surround your opponent's Queen. If you do not have enough pieces, it is useless to keep attacking relentlessly, and it might be best to fall back on other plans.

Mobility and Tempo are crucial in the opening phase, while Material is initially less important since none of the players is short of bugs.

To increase your mobility in the opening, follow these general principles:

- Ants are the most flexible and the fastest bugs, and they should be played as soon as possible. As you do not need to decide immediately their final destination, you can adapt more easily to upcoming moves.
- Try to pin more than one of your opponent's pieces at the same time. In other words, move a bug to the end of a string of enemy bugs. In this way, one of your bugs will neutralize more than one opponent's piece.
- Try to move your pieces to, or next to, hexes that you want to take away from your opponent. In other words, try to control your opponent's placement from the reserve.

Ants are also the most efficient defenders as often they can pin any of your opponent's pieces ready to attack, and you will have normally at least two possible hexes to choose from. Most other bugs have limited movement, either length-wise (Beetle, Spider) or direction-wise (Grasshopper), and therefore they have to be placed only when they perform a specific task. For example, you want a bug to reach a specific hex on the board for a pin, but it can only pin from a given hex.

In Figure 1, you find an example of a typical opening situation, where White wants to move his Ant to pin Black's Ant. This is a sensible idea as it will increase White's mobility at expense of Black's (it is not the only possible idea of course). Having placed an Ant early, White can choose which hex to occupy in order to pin Black's Ant—A, B, or C. Each of these hexes has pros and cons. The pin on hex C would be released as soon as Black moves a bug into hex Y, because then the Black Ant will be free to move again. The same is valid symmetrically for pin A. However, with pin A White also prevents Black from placing a new bug from the reserve directly into hex X. The safest pin would be from spot B, but then Black will be able to use hex X easily. As far as we know, there is no 'correct' move in this position. One has to be aware of the differences between the options and be able to exploit them later in the game. This makes Hive very complex and fascinating.

The concept of tempo in the opening can be understood in relation to player colours. White has necessarily a small advantage, being the first player. This means that White's count, the number of moves needed to surround opponent's Queen, is initially lower than Black's. If both players use two moves to occupy each hex next to the opponent's Queen—firstly, put down a new piece from the reserve; secondly, attack the Queen—White would always win.

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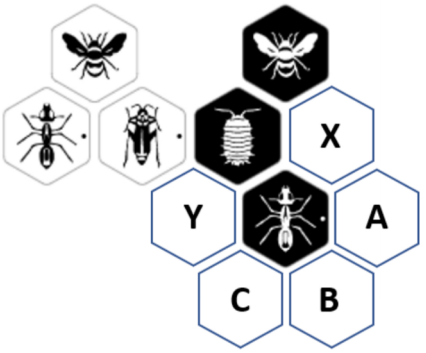


Figure 1. Opening situation where White has many options to choose from for a pin.

This seems trivial, and it is true for many other symmetrical abstract games. For Hive, it is particularly valid, given that the types of pieces surrounding the Queen is not important, only their number. White's purpose is to maintain the advantage in tempo, while Black's is to find moves to unbalance the game and increase White's count. With all the expansions, White's advantage is typically very small and any inaccuracy can shift the count in Black's favour. Moreover, in most cases, counting is not the only factor to consider, so we have to rely on other principles, such as typical pieces patterns or typical manoeuvres.

As regards Tempo, I identify these key principles:

- Always keep the count in mind, and compare your count with your opponent's count. The count will generally tell you who has an advantage at a certain point of the game.
- To increase your opponent's count you should aim at one of the following ideas: (a) pinning one of your opponent's bugs next to the enemy Queen, (b) placing next to your Queen those bugs able to escape and, preferably, able to attack the enemy Queen within the same move. This helps to take the count in your favour.

A simple example is shown in Figure 2. Both the White and Black Queens are under attack, the White Queen is even covered by the bB1, but White seems to be ahead as he needs only two moves to surround the Queen and one move to surround the Mosquito at the same time. Note that if the Black Mosquito was not surrounded, it could use the Pillbug power to rescue the Black Queen.

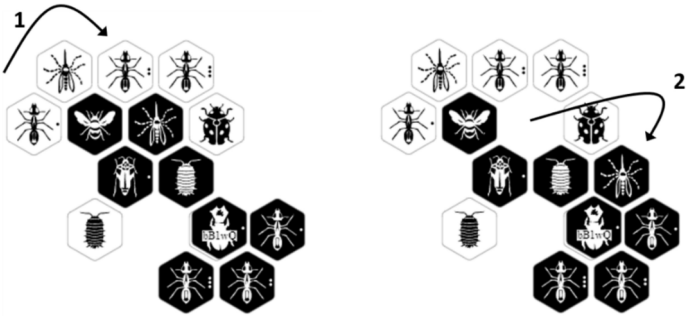


Figure 2.Counting is tricky when one of the pieces can defend and attack at the same time!

Therefore, after 1. wA2 bQ/, White needs only one more move to

win, while Black seems to need two moves. However, White has not considered that the Black Mosquito can mimic the Ladybug; or that the Black Mosquito can be moved by the Black Pillbug, and jump out of its hex and land on a killing spot, with 2. bM bP-! In this way, Black is able to reverse the tempo count, as he only needs one more move to win, while White has now two more hexes to occupy in order to win! This would not have been possible if a Spider or Ant were played instead of the Mosquito, or if the black Pillbug were not in position.

Opening example

Now, let us have a look at a typical opening sequence to understand how to think about your next move:

1. wL, 2. bL wL-, 3. wA1 -wL, 4. bM bL-, 5. wQ wA1\, 6. bQ \bM, 7. wM \wL, 8. bA1 bL\ (Figure 3)

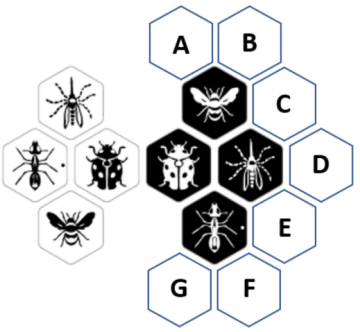


Figure 3. Example of a very common L-L (Ladybug-Ladybug) opening.

The reason for each specific move will be clear later on. From the second Tempo point, above, comes the idea that the Ladybug is a strong defender, because after it is released, it can jump out quickly and easily and attack. Indeed, good conditions for the defenders to be released must be carefully created by the players.

Looking back at the position in Figure 3, note how both players have played an Ant and an adjacent Mosquito, so that both pieces are ready to pin the opponent's Queen or other pieces. From this position there are 14(!) meaningful continuations for White, considering only the possible movements of wA and wM to the hexes indicated, from A to F. Indeed, the game branches out very quickly, although we are not going to see the variations in detail here. Let us examine one sensible variation. Assuming that White will pin Black's Queen in the next turn, by moving the wM to hex B (Figure 4, left), how will Black react?

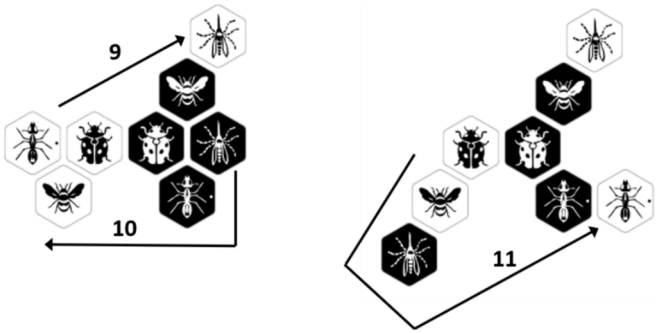


Figure 4. (Left) position after move 9. (Right) example of a symmetrical response by Black (but probably not the best defence).

As said above, Black's copying White pinning Black's Queen is normally not advisable. Imagine Black playing 10. bM /wQ (Figure 4, right). White would play 11. wA1 bA1-, getting a better position—both players have pinned the opponent's Queen but White mobility is higher, because White still has one free Ant. Due to the extra free Ant, the tempo count is also still favourable to White, who needs one move less than Black to win. Even though this does not mean that the situation is desperate for Black, if he keeps attacking without counting, sooner or later he will realize that he needs to defend. Therefore, Black will have to combine attack and defence very precisely.

Instead, an easier defence for Black stems from the principles above, increasing mobility and decreasing your count. Instead of move 10, above left, a reasonable response for Black would be bM \wA1 (Figure 5, left). The bM pins the wA1 next to the wQ. This move increases Black mobility, because bA1 and bM are free, versus only the wM, which has limited movement choices for now. Black pieces are mobile and ready to defend against very dangerous Beetles attacks. Additionally, the hex bL- can be used to place another defensive piece, such as the Pillbug or a Beetle, and as soon as White places another Ant, this Ant will be pinned by the bA1. The game is balanced. Another sound alternative for Black would be to play a second Ant, bA2 bA1- (Figure 5, right). This latter Ant can be immediately pinned by the wA1, but at the same time Black has created a safe space for the bM, also called a pocket, a typical pattern that will be discussed in the coming instalments.

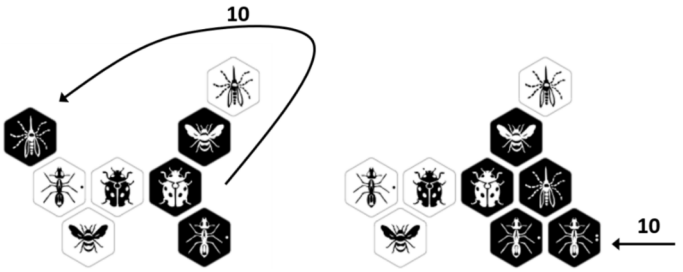


Figure 5. Two plausible alternatives for Black instead. (Left) Black keeps mobility high, pinning the White Ant. (Right) the Black Mosquito is safe in a pocket formed by four Black pieces and two Ants are ready to react to future White threats.

White could also use his ant to attack the Queen with 9. wA1 bQ/ (Figure 6, left). In this case, White has moved a piece away from his Queen, preventing the variation shown in Figure 5, left.

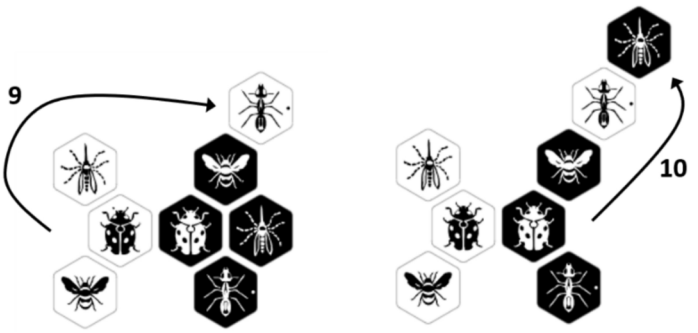


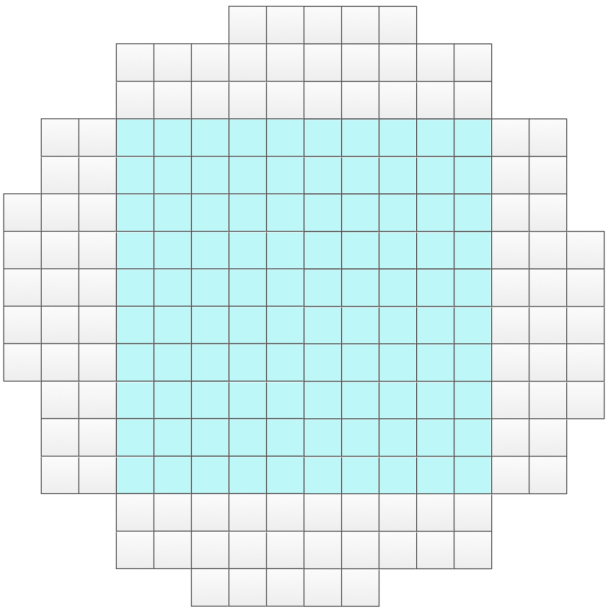
Figure 6. White's alternative at move 9 and a possible defensive approach by Bl9ack at move 10.

(Continued on p. 45.)

by David Bush

In 1966, Parker Brothers issued the excellent game Universe. The set I was given must have been made in 1968 or later, because the box featured publicity stills from the movie *2001: A Space Odyssey*. One of the shots shows an astronaut apparently playing Universe against Hal. The game is a collector's item now, and sets are difficult to find on eBay.

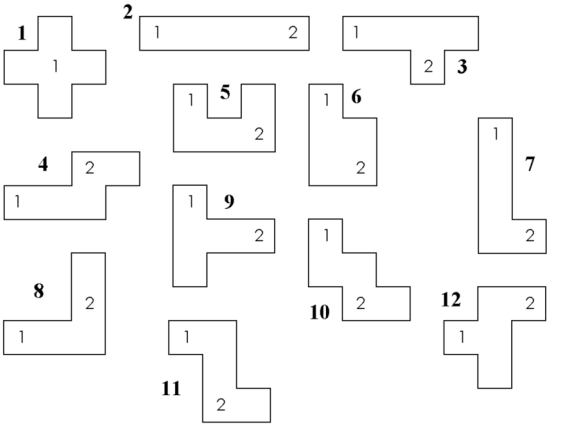
Universe is for two to four players. The board consists of a central 10x10 region and four additional regions arrayed along each side, in a rotationally symmetric fashion:



Universe board.

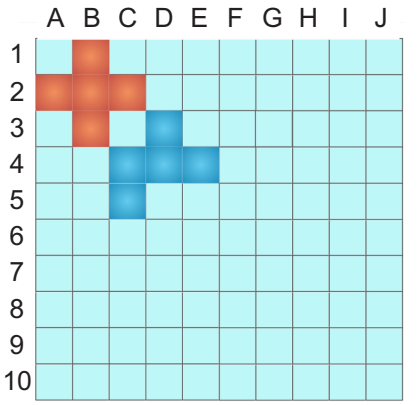
Each player has a set of pentominoes. If you have played Tetris, you know what a tetromino is. A pentomino is five squares connected flush, side to side. There are 12 types of pentominoes, not counting rotations or reflections, see opposite.

The pieces do not actually have numbers imprinted on them, but I have added numbers here, for the purpose of establishing an unambiguous syntax for move notation. Each piece shape has its own distinct number. Pentomino 1 is the only piece that does not occupy different squares when rotated or flipped, so its location can be indicated with just one set of coordinates. All the other pieces use two sets of coordinates. The first set will correspond to the square indicated by 1, and the second set of coordinates will be the location of the square indicated by 2. See the diagram at the bottom for an example.



Pentominoes with notation for recording p

Each set is a distinct colour: White, Yellow, Red, or Blue. The following two-player positions will use Blue versus Red. A four-player game uses the whole board. Three players use the central region plus any two outer regions. Two players use just the 10x10 region. The board is empty of pieces at the start. Blue moves first. Each move consists of placing one of your pieces on the board, aligned with the grid, on five previously vacant squares. Pieces remain where they are placed. You may not 'fence off' any region of one to four vacant squares with your move. For example, in the following diagram, Red's piece is illegally placed, because it fences off two regions of one square each. (The notation for Blue's move here is 12-D3-C5, and Red's illegal move is 1-B2.)



Illegal move by Red.

This means, if a region of 6 to 9 vacant squares is fenced off, it becomes a 'dead zone' where no one may play. If you have no legal move on your turn, you lose. The winner is the last player to make a move. This is a very absorbing and pleasing game, and can usually be played in 20 minutes or less.

The pieces are fun to play with! There are several puzzles involving pentominoes, and this game gives you four complete sets, made of durable plastic! The board is framed in plastic, with a raised border around the perimeter. This helps protect the board, and helps to align pieces that touch the edge. Unfortunately, the board I got did not come out quite square. The pieces are made

accurately, but if you try to fill all 200 squares, some pieces will always pop out somewhere. Perhaps this is why the rules prohibit fencing off regions of 1-4 squares. Besides speeding up the game, it tends to result in more empty space, so play is still possible even if the board is a bit warped. I suppose I could shave down the sides a little….

Ironically, although the opening is the most difficult phase of the game to understand, it is possible to throw away the game on the first move of a two-player game! That is, there is a first move, which not only loses, but loses so badly, that the second player has a very simple and unstoppable winning strategy. If the first move occupies either one or two of the four central squares, then in almost every case, the opponent can respond by making the rotationally symmetric move. I call this the "symmetric strategy." Once the central region is closed off, Blue will be unable to break symmetry. Red will be able to respond to each of Blue's moves this way, and will therefore be able to make the last move of the game. But there are a couple of exceptions to this. (1) What first move can Blue make, which occupies either one or two of the four central squares, against which Red cannot win by using the symmetric strategy? Note that Blue's first move might very well be a losing move, but in order to win, Red will have to try another approach than the symmetric strategy.

Suppose the board were 10x9 instead of 10x10. Now there are just two central cells, instead of four. Blue makes a first move which occupies precisely one of the two central cells. Red responds with the symmetric strategy for as long as possible. If the symmetric strategy becomes impossible, Red makes the best possible sequence of moves. Even so, Blue is able to win the game. (2) How could this happen?

The move tree in the opening is quite dense, but each move drastically reduces the number of legal moves remaining for each player. For example, if Blue makes the initial move 12-D3-C5 as shown in the previous diagram, Red's legal responses are reduced from 3960 to 2988, and Blue's choices go down from 3960 to 2632. As far as the first move is concerned, if you do not count symmetrically identical moves or moves that immediately lose, you need consider only 427.

There are natural criteria for evaluating early moves. For example, the asymmetric pieces 3, 4, 7, 12, and especially 6, can be placed on the board in many distinct ways, and are therefore more likely to be playable in the endgame. 12-D3-C5 is probably a bad first move; piece 12 should be saved for later. Piece 1 is a much better piece to "get rid of" early on; there are only 60 ways to play that piece (as opposed to 568 ways for piece 6), and it is probably the most difficult piece for your opponent to try to fence off a region of that shape.

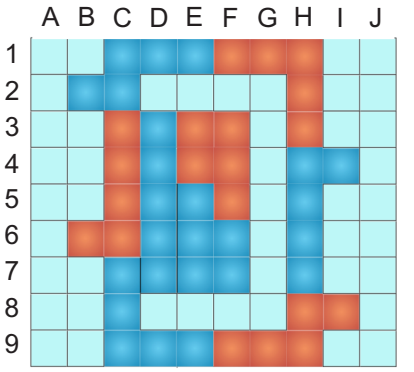
The most important goal to aim for is to fence off a move only you can make, and which your opponent cannot block. Such a region is usually 5 squares in size, but could also be a portion of a larger region (10 squares or more.) Once you get this reserve move, if you can prevent your opponent from doing the same to you, a win is assured. Naturally, you would want to keep that move in reserve until the end. A reasonable secondary objective in the opening would be to reduce the opponent's responses as much as possible, while reducing your own future choices as little as possible. ■

David Bush is an expert Twixt player, who contributed articles on Twixt to AG2, AG4, AG7, *and* AG8. *Universe is playable on boardspace.net. The Universe article was originally submitted for* AG17 *in 2003, and we are glad finally to bring it to readers. ~ Ed.*

Universe Puzzles

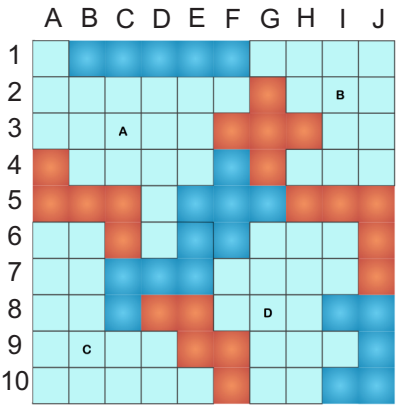
1) On a 10x10 board, if Blue plays 1.5-E5-D7 then Red cannot respond symmetrically, because that would fence off two regions of one square each. 1.10-D5-E7 is another exception.

(2) Here is how Blue could defeat the symmetric strategy on a 10x9 board. After 1.6-E5-F7 2.6-F5-E3 3.7-H7-I4 4.7-C3-B6 5.8-C7-D9 6.8-H3-G1 7.4-E1-C2 8.4-F9-H8 9.2-D3-D7 we arrive at the following position:



Now Red cannot make the symmetric move, because that would fence off two regions of four squares each. The only other piece that might legally fit in the central vacant region is piece 7, which has already been used. So, the central region is unplayable by either side. That leaves the two end regions. Red cannot place piece 2 in either region without illegally fencing off one to four squares. So, Blue can win from here by employing the symmetric strategy against Red!

(3) Here is a puzzle, to introduce you to tactics. The regions are labelled to help clarify the solution.



Blue to move and win.

See page 42 for the full solution.

The short article on the following page was submitted by L. Lynn Smith and would have belonged to "The History of 3D Chess, Part 7." We were not planning to include this Quadlevel Chess article yet, and it is not in the web version of Abstract Games. *However, the spacing of the print layout needed an extra page. The article comes from the archives as formatted.. We have several other articles in the archives by L. Lynn Smith, and we hope to bring these to readers incoming issues. ~ Ed.*

(Continued from p. 11.)

Halma is the representative of the Victorian-era classics, a surprising but welcome choice, ahead of Reversi. All the other games are of relatively recent origin, ranging from the mid-Twentieth Century almost to the present. Chess, Shogi, and other chess-type games are omitted because of their differentiated pieces. The mancala games lack a representative for the opposite reason, that their pieces are not distinguished by player.

The articles that accompany each game offer some strategy and tactics in addition to the rules. Understanding a little about how a game works can make playing the game that much more enjoyable. Our approach in Abstract Games *has been largely similar.*

*In other sections of the book, David broadens the discussion to emergent properties of games, social aspects of games, the question of what makes a game great, and so on. He presents a secondary list of fifteen games, given only with basic information and the rules. These are important games the author thinks should be recognized, while they do not make the initial cut: Triskelion, Hexdame, Y, Unlur (*AG12*), Xodd, Dispatch, Oust, Agon, Network, Ayu, Archimedes, Nex, Sniggle, Omega, and Coil. The book is shaping up to be a classic. In its aim and execution it is unique. David is undertaking a great service for the world of abstract games, and I wish him every success.*

As you an see above, many of the top games that David covers have been included in older issues of Abstract Games*. Nevertheless, many we have not touched yet, understandably because they are games that have been developed since the demise of the old series in 2003. As Cameron Browne demonstrates in the preceding interview, the number of games has exploded over the intervening 16 years. We need to catch up, and I hope we will be able to supplement David's investigations with articles in the new* Abstract Games*. ~Ed.*.

"It is in games that many men discover their paradise."
~ Robert Wilson Lynd

(Continued from p. 7.)

Are you the kind of game player who plays a just a few games or do you play many?

I tend to play many different games a few times each, especially as my current research project exposes me to so many strange and wonderful games from all time periods and all over the world. It's so important to actually play a game to get a feel for how its rules work together, which may not be obvious from just reading its description, and part of my work day is often spent trying out new games with my team.

There are exceptions. I played Backgammon for the first time one Saturday evening many years ago with a flatmate from university. We just kept playing game after game… into the evening… through the night… past the dawn… and into the the next day. That's one way to really learn a game.

Thank you very much, Cameron. It was so kind of you to contribute, and to respond so graciously to my questions.

You're most welcome! They were interesting questions that made me think.

And it's great to see *Abstract Games* magazine back in action. I'm not alone in hoping that it continues for many years to come.

Thank you again, and wishing you many more amazing discoveries! ■

Cameron Browne: http://cambolbro.com.
"Evolutionary Game Design: Computational Intelligence and AI in Games" https://ieeexplore.ieee.org/document/5404867.
"Playing Games across the Superintelligence Divide": https://www.aaai.org/ocs/index.php/WS/AAAIW16/paper/download/12645/12350.
Game & Puzzle Design Journal: http://gapdjournal.com.
Ludeme Digital Project: http://ludeme.eu.

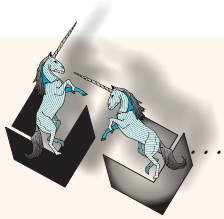
Universe Puzzle Solution, from p. 41.)

Both players have used pieces 1 and 11, so no moves involving those pieces need be considered. Region A is in the range of 16-19 squares, so a maximum of 2 moves can be played there. There are 3 ways to move that would split region A into 2 dead zones, rendering further play there impossible. Region B is in the range of 11-14 squares, so only one move will fit. Regions C and D are both 15 squares, which means dead zones cannot form there. There will be room for 3 moves in both C and D, unless of course the players have already played the required shape piece.

The first thing Blue should look for, is a way to fence off a reserve move, in the shape of piece 8 or piece 10, which Red alone has played. Blue might also seek to avoid giving Red the opportunity to fence off a region in the shape of piece 2 or 5 or whatever piece Blue is going to play this move. If the battle to reserve moves comes out equal, then affecting the parity of the remaining moves (odd or even) means you choose which side plays last. It might be possible to affect parity in each of regions A, C, and D.

There is a move in region A which fences off a reserve move for Blue: 1. 7-B3-E4, which reserves 8-B4-D5. The only hope for Red now, is to try to create a reserve move in region C or D. Red can do this by playing 2. 7-B6-C9, which reserves 2-A6-A10, but after 3. 12-I9-G10 Red is in parity trouble. There are precisely 6 moves remaining on the board, and it is Red's move. Blue cannot be stopped from moving last. Red could instead try 2. 3-D9-B8 reserving 2-A10-E10, but then Blue has 3. 4-G10-F8, which has the effect of reserving two more moves, one just for Red, and one just for Blue. This leaves an even number of moves on the board, and both players have the same number of moves in reserve. Red has the move, and is therefore lost.

Does Blue have another winning move? Any other move in region A would allow Red to play 3-D9-B8 reserving 2-A10-E10, and Blue will not be able to catch up with Red in reserve moves. Parity doesn't matter, if your opponent has more reserve moves than you do. Blue could play 1. 4-B9-D10, which reserves 8-A8-B10, but Red can respond with 2. 9-B2-C4, reserving 4-A1-B3. Now, strangely enough, there is no good move for Blue in region D! For example, after 3. 12-I9-G10 there are 3 places on the board where only piece 6 will fit, but since each player has only one copy of each piece, these 3 places correspond to only 2 moves, so now Red can play 4. 7-G1-J2 and Blue is facing a parity loss. If Blue tries 1. 9-A10-C9 then 2. 7-E3-B4 wins for Red. Or if 1. 3-B10-D9 2. 7-B6-C9 3. 7-B3-E4 4. 5-I7-H9 and only one move remains playable in region D, so Blue loses. Or 1. 12-B8-A10 2. 9-B2-C4, and again there is no good move for Blue.

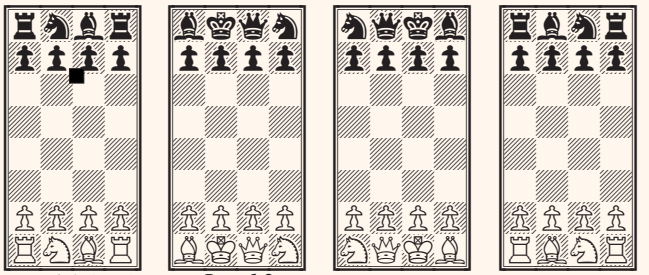


Quadlevel 3D Chess

. . . and the Shape of Things to Come

by L. Lynn Smith

Inspired by the playing field in the Star Trek television series, Robert Koernke, Sr. began his development of the "sensible" 3D Chess game around 1970. He came upon the concept of the 4x8x4 playing field while doing research at the University of Michigan library. He subsequently created his own rules for a game on this board that used two complete sets of chessmen. Koernke called this game "Quadlevel 3D Chess.



Setup for Quadlevel 3D Chess

The first thing to note about Quadlevel is that all movement involving a change of level is restricted to the vertical plane containing the piece that is aligned with the long sides of the board. In other words, a change in level cannot be accompanied with a sideways movement. This is called the "change in distance" rule.

The Pawn steps one vacant space forward orthogonally on its level or captures one forward diagonally. It can perform an initial two-step move, and freely promotes upon reaching the far rank. Because of the restriction on change of level, diagonal Pawn captures that change level cannot be sideways. The rule of *en passant* applies, even to change-of-level captures.

The Rook slides orthogonally. The Bishop slides diagonally, but not the right or left change in level diagonal. The Queen combines the power of the Rook and Bishop. The King steps as the Queen. The Knight performs its classic 3D leap. Except for the Rook, all pieces experience some restriction in movement when changing level because of the change in distance rule.

Each King has the capability of performing four distinct castling maneuvers. The King on 2b1, for example, can castle in the following ways: K2b1-2a1/R1a1-2b1, K2b1-1b1/R1a1-2b1, K2b1-2d1/R1d1-2c1, and K2b1-4b1/R4a1-3b1. The other King castles similarly. Each castling maneuver on the Kingside requires the Knight and Bishop to be out of the way, and the Queenside castle in addition requires the Queen be out of the way. As in Orthodox Chess, neither the king nor Rook can have been moved previously, and castling out of check is not permitted.

Originally the game was won by checkmating both Kings. Because of the difficulty of this task, it is now acceptable to merely mate one of the Kings.

The following is a game between Robert Koernke, Jr.(Black), son of the inventor, and Tim O'Lena (White). The notation is an obvious adaptation of standard Chess notation. Commentary is supplied by Tim O'Lena.

1.3c4 2b5, 2.2b4 3c5, 3.N3d3 *(I wanted to see how the standard double KP opening would work in Quadlevel. In this case, it's a double-double KP opening (Quad KP opening!). The Knight move was supposed to continue in this vein while having an effect similar to the same move in orthodox chess.)* **3....2c6** *(Protects his King Pawns.)* **4.N1c3** *(Continuing to develop and pressure his center.)* **4....N2b7, 5.N3b3 4a6, 6.B3c2 B4a7, 7.N4b3 1a6, 8.1b3 B1a7, 9.1a3** *(This development covering two new diagonals seemed more active than Black's recent "fianchettos.")* **9....N3c6, 10.Q2a3 N2c4, 11.Q2c3 N3b6, 12.B2b2 1b5, 13. 2d3** *(I used Zillions piece evaluations in this game, where B=2.9, N=3.2, R=3.3, and Q=6. I did not care if he traded his Knight for my Bishop. In fact, I tend to value the 3D Knights more, which is not necessarily an accurate assumption given the QuadLevel change in distance rule. I also, however, missed the obvious Pawn fork!)* **13....Nx2b2, 14.Q3x2b2 1b4, 15.Bx1b4 bx1b4, 16.Nx1b4 1a5, 17.N3b5 N2b6, 18.3a3 Nx3b5, 19.bx3b5** *(I am starting to like White's Pawn center and intend to build it up as much as he will allow.)* **19....2O-O2** *(Now Black blunders as well. Each side was to preoccupied with their own plans.)* **20.bx2b6 Rx2b6, 21.N2b4 2a5, 22.Q(b)2a3 N1b7, 23.Q1c4 1a4** *(White values the Queen at only 6 and is willing to liquidate it to expose the upper Black King. White figures he's ahead in material at this point and is willing to give a Pawn's worth back in order to loosen up Black's position.)* **24.Q(1)x1a4 N2b5, 25.Q(1)x2a5+ Bx2a5, 26.Qx2a5+** *(White figures he is now still ahead by half a Pawn and may have new tactical opportunities.)* **26....N2a7, 27.3O-O4 3a6, 28.Q2a3 3b5, 29.2O-O2** *(Moves the King off of the open file.)* **29....bx2b4, 30.bx2b4 1c6, 31.3b4 K3a7, 32.B2b3 4c6, 33.3b5 R2a6, 34.Q1a4** *(White wants to push his Pawns and focus his pieces on Black's Kings as much as possible. White feels an initiative and is trying to pursue it.)* **34....R1a6, 35.Q3a4** *(Playing as White had hoped. I wanted his Rook off of the 2a file where it pressured my King. I wanted my Queen on the 3a file where it pressured his King.)* **35....N1a5, 36.Q4a3** *(The Queen is still active, pressuring his Rook and still able to get at his King. The displacement did not hurt White's chances.)* **36....3a5, 37.B1b4 N2a7** *(White's real target is of course the 4b Pawn.)* **38.B1c4 R1b6, 39.Q4a5** *(Threatening mate via King fork!)* **39....Q3b7, 40.Bx4b7** *(Notice that QxB allows Q3a6 mate. Moving the 4a Rook to safety allows Q4c7 mate.)* **40....Q(2)3c7, 41.Bx4a8+ Rx4a8, 42. R(2)3b1** *(Threatening to fork King and Queen.)* **42....Q4c8, 43.K1a1 N2b5, 44.2c4** *(Taking every opportunity to build a beefy Pawn center.)* **44....N2d4, 45.K4d1 B1a6, 46.Bx1a6 Rx1a6, 47.1d3 N3d6, 48.2a4** *(Trying to throw everything I have at his Kings.)* **48....Q(4)4b8, 49.4b3 Q4c7, 50.Q3a4** *(White needs the Queen to be part of the attack.)* **50....R1b6, 51.2b5** *(Still trying to come at him.)* **51....R(b)1b8, 52.2b6 Q3b6, 53.Q1a6 B2a8, 54.N3b2 K4c8, 55.N2b4 Q1b4, 56.N1a4 Qx2b4, 57.Q1a5+ Resigns.** *(Black is in check and has only four replies. They all lead to loss of material, and White will still have his initiative.)* ■

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Special thanks to Dan Troyka for research.

LEY LINES

by Eric Solomon

David Parlett recently reminded me that I had once written "Every abstract game is a failed thematic game." Of course that is nonsense, and no one should know it better than I. But what I meant to say was that if a good theme presents itself in a newly invented game, one is crazy not to use it. Originally the game Ley Lines appeared to have a theme based on the mysterious linear alignments of ancient monuments, churches, burial mounds, etc. which dot the English countryside. 'Mysterious,' that is, to those who prefer occult to rational explanations. Mathematicians demonstrated long ago that random distributions of points on the plane normally contain regular patterns and, specifically, linear alignments. And, in general, more than one might expect.

I submitted Ley Lines to Amigo as a game in which some sites on the board were marked by fixed castles, and others were marked by counters randomly distributed across the countryside before play. Each player attempted to visit the most sites in a succession of moves along straight lines. Having reached a site he was 'energized by the power of the vibrations' (or some such pagan gobbledygook) to move on immediately to the next site, if any, without changing direction. Without going into further detail, Amigo quickly bounced the game back to me, with the remark that although it worked as an abstract game they were looking for 'fun' thematic games. In short, it was a 'failed thematic game,' but I think it makes a 'fun' abstract game. Hopefully readers who try it will agree.

Rules

Ley Lines can be played by any number of players, but it is not recommended for four or more. The players take movement turns in the conventional way.

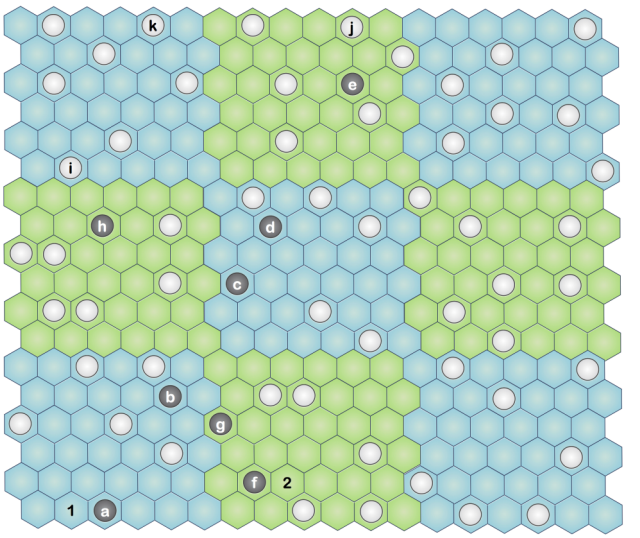
The board is a rectangular 18x18 array of hexagons, as illustrated, and the sites are marked by white Go stones before they are reached by a player, and black stones after they have been reached. Each player is represented by a coloured ring large enough to fit around a stone and, ideally, the hexagons should be large enough to accommodate the ring. As moves require the ring to be picked up from around stones it should be at least as high as the thickness of a Go stone.

The white stones must first be randomly distributed over the board. Now, in many games where this is necessary it can be a problem because players suspect that it is possible to bias placement to favour one player or the other. This is impossible under the rules of Ley Lines. The number of white stones is not critical, but 54 is recommended as a minimum. More stones produce a longer game. These are shared evenly between the players who then place them randomly so that there are at least six stones in each of the 6x6 zones delimited by colour on the board, as illustrated. These zones are only relevant when placing stones at the start of the game. Placement can be done simultaneously, and timings show that this rarely takes more than a minute.

Having placed the stones, all players may study the layout for one minute, then they place their rings on any vacant cells. The LAST player to place his ring takes the FIRST movement turn, and the FIRST shall be LAST as you might expect. This effectively ensures that no player can set up a pattern of stones exclusively favourable to himself, though in any case no one has discovered how to do this.

There are two types of movement. First a player may move his ring one cell in any direction to or from a vacant cell provided he does not land on top of another player's ring. No stone may be captured in this sort of move. That is important. Second, if a player's ring surrounds a stone of any colour he may jump directly to the next stone of any colour along one of the principal directions. After the first such 'jump' of his turn, he may optionally continue with further jumps provided he does not change the direction of movement and, again, he must not land on a cell occupied by an opponent's ring. If during a 'jumping' turn his ring starts on, or reaches, a white stone he captures it and replaces it with a black stone. Stones captured by a player must be kept in two piles (small boxes are better). The first pile is for complete lines of white stones captured in a series of jumps, in one turn, which visit every stone in a line, and in which no black stones are visited. These will count double in the final scoring. The second pile is for white stones which do not qualify for the first pile—stones 'mopped up' from lines which have been partially traversed by players' rings. It is important to note that complete lines can only be captured, and so score double, if the preceding move was a single step move.

The game ends when no player wishes to continue, and the scores are then assessed. Each stone in a player's first pile counts as two stones.



Sample position

In the 2-player game illustrated above 63 stones have been used, and each player has taken two turns. Player 2 placed his ring on the vacant cell marked 2, then player 1 placed his on the cell marked 1. Hence player 1 took the first movement turn, and he single stepped to cell 'a'. Player 2 then single stepped to 'f'. Player 1 jumped from 'a' to 'b' to 'c' to 'd' to 'e', capturing 5 stones which will score 10 because he captured all stones in a line. Player 2 jumped from 'f' to 'g' to 'h', and could have gone on to 'i', capturing all 4 stones in the line. But 'i' appears to offer little opportunity on his next turn. From 'i' he could capture at most one stone. Player 1 has a number of options from cell 'e'. Perhaps the most attractive is to get to cell 'j' in two single-step turns, then capture all stones on the diagonal which passes through the cell marked 1. Would he still choose this route if player 2 had ended his last turn on 'i'? From 'i' Player 2 could jump to cell 'k' on the top horizontal line, threatening to visit 3 stones including 'j' on his next turn. Capture of the white stone on 'j' would stop Player 1's hope of capturing all stones on the diagonal from 'j'. However, Player 1 can get to cell 'j' just before this, and then Player 2 cannot land on 'j' because it is occupied by Player 1's ring.

Ley Lines is essentially a route-finding game demanding spatial foresight and accurate assessment of tempo. There is no opportunity to set traps for opponents. Nevertheless, there is considerable player interaction because cutting across opponent's potential lines is a sound tactic. ■

In AG11 *we published an article by Dr. Eric Solomon about his game Entropy. The game article ran alongside an interview with the designer. Eric later submitted the Ley Lines article for* Abstract Games*. We are honoured finally to present this game to our readers. Eric Solomon has been designing and publishing games since the 1970's, and he is the creator of many original titles, including Conspiracy (formerly Sigma File), Black Box, Entropy (now Hyle), Billabong, and many others. In 1973, he published the book* Games with Pencil and Paper*, which was highly original in its day. Eric's game Corporation is available from Nestor Games, and Conspiracy (formerly Sigma File) is newly published by Restoration Games. ~ Ed.*

(Continued from p. 39.)

Black still has a few alternatives. One that I would like to highlight is 10. bM wA1/ (Figure 6, right). At first, it seems odd that Black is pinning a bug (wA1) already in a killing spot, next to the enemy Queen. However, in this way Black maintains his mobility and prevents White from placing other bugs, especially Beetles, too close to his Queen. It is an example of defensive (or *prophylactic)* thinking, where Black prevents an attack rather than defending later. Obviously, this is by no means forced here, and Black could play a few different moves while keeping a balanced position. However, you may have an idea of the richness of the opening.

The first bug placed

The first bug played is always important for both players. Although the first move can define the style of the rest of the game, there is by no mean a 'wrong' first move. However, each bug carries a slightly different strategy one should be aware of. I suggest starting from the top of the list below, and working your way down as your skills improve and you want to experiment with different ideas.

- The Ladybug and the Grasshopper are by far the most common openings for both White and Black. They are excellent defensively as they can jump out as soon as there is a chance. The Ladybug will have more possible escape hexes than the Grasshopper, a big advantage in many cases, when you can immediately attack the enemy Queen. At the same time, you have to consider that if the Ladybug remains stuck in position, you will not be able to use one of the most flexible attackers. Normally, the player who places the Grasshopper will try to avoid the formation of rings, loops of connected bugs, unless that player can control where the Grasshopper will move when the ring is broken.
- The Pillbug is a common opening for White or Black. It used to be considered risky if played by White, as Black can respond with a Mosquito, obtaining virtually a second Pillbug immediately. However, this is not a huge concession, and there are other advantages to White's choice. For example, you do not have to worry about when to play the Pillbug in the succeeding moves and it will often be very close to your Queen. On the other hand, the Pillbug will be the closest piece to your opponent's swarm, so it can be more easily reached by an enemy Beetle. When Black plays the Pillbug as first bug, typically a Mosquito is placed right next to it in order to create a strong defensive setup.
- The Mosquito is probably the strongest piece and you might think it should not be played so soon. However, it is so flexible that it will easily be able to escape and do some serious damage. Simply place a Ladybug, Grasshopper or Pillbug next to it and create the conditions to release the Mosquito at the right time!
- The Spider, Ant, and Beetle are much less common openings, because either they cannot jump out (Ant and Spider), or they are too valuable (Beetle) to leave them stuck in the middle of the Hive. Some master players open with these bugs sometimes, but their use needs a more careful analysis—discussed in future instalments.

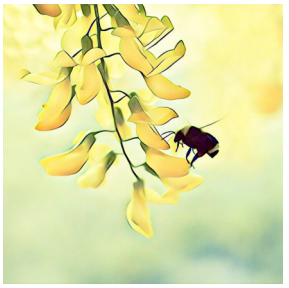
Conclusions

Hive is a very tactical game, where several sensible options exist at every move, and it is easy to go wrong in the opening phase. Here, I tried to give some examples and explain the main ideas that should facilitate the thinking process at the start of the game, for beginners who want to improve. At the same time, I hope I have given a small taste of the richness of the game. Further details will be treated in future issues! ■

References and resources

- The Hive notation is explained at Boardspace.net. Boardspace.net is also the website where the online Hive Championship is played.
- An off-line tool is available to review the games played on Boardspace.net.
- *Play Hive like a Champion* contains all the strategic ideas in this article, and much more.
- The diagrams here were made using a great online tool: http://entomology.appspot.com/.
- BoardGameArena is a very good place to play turn-based games of Hive.

Francesco Salerno was born in Italy in 1992 and currently lives in London pursuing a PhD in Chemistry. Hive is his favourite modern abstract game, and he has played more than 1000 games on the website BoardGameArena, holding an Elo rating within the top 50 players in the world. So far, he has competed in three editions of the Online Hive World Championship held on Boardspace.net and won the Brilliancy Award in 2018. He has also founded the facebook group "Hive the boardless game" through which he is popularizing the game as much as possible.



Agon

The Queen's Guard

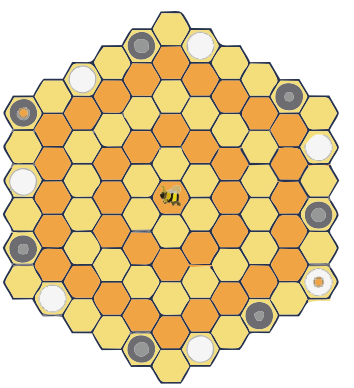
by Kerry Handscomb and David Ploog

In the original series we often included a board design on the back cover, for people to try a game. The boards were necessarily small, and players had to find their own pieces. More recently, the whole category of print-and-play games has arisen, of which hundreds exist on BoardGameGeek. Our early efforts may be characterized as proto-print-and-play games. However, perhaps a first experiment in ready-printed boards was The Boardgames Book *by R. C. Bell in1979, containing some 25 game boards, including Agon. Then in 2001, Michel Boutin published* Jeux de pions pour aujourd'hui *(reviewed in AG9), which consisted of 12 game boards for vintage games along with a book containing rules and commentary on all 12 games. Agon was one of these 12 games. We again present Agon, with a board on the back cover, typical of our old series. Agon deserves attention for several reasons—see below!*

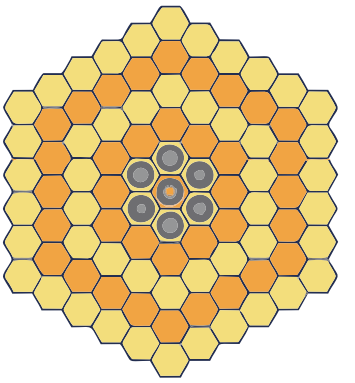
The information on Agon here comes from David Parlett's article in *The Oxford History of Boardgames*. Agon is very probably the oldest abstract game with a board space consisting of hexagons rather than squares. It may have been developed in France, in the 1780's, a little before the French Revolution, as there is evidence of the existence of Agon boards in France at that time. The first actual rules for Agon, however, do not appear until 1872, in Victorian England. My guess is that Agon was a game of the French aristocracy that did not survive the Revolution. The appearance of Agon in England is roughly contemporary with other Victorian-era games, such as Halma and Reversi. A board for playing is on the back cover. Small Chess Queens and Pawns would be ideal for the pieces.

The starting position is shown in the diagram below left. Each player has six Guards of her colour, and one Queen, marked with a sun in the diagrams. The players take turns to move one of their own pieces. In a regular move, a piece is moved to a vacant adjacent space, with the proviso that no moves can be made away from the centre of the board. Thus, a piece can move "sideways" to a space of the same colour, or towards the centre to an adjacent space of a different colour. A player is not permitted to move a piece so that it is sandwiched between two pieces of the opposite colour, where the three pieces together form a straight line. The objective is to move your six Guards and Queen to achieve a position at the centre of the board, as shown in the diagram below right.

On the other hand, it is quite permissible to move yourself to trap an enemy piece between two of your own pieces in a straight line. If a player does have one or more of her own pieces trapped in this way, when it is her turn to move, she must move to rescue these pieces. A Guard, when rescued, must be moved to a vacant space on the periphery of the board; the Queen can be moved to any vacant space, even to the centre space. Obviously, it may be good to have your Queen trapped, because you may reposition the Queen favourably. Of course, these rescue moves cannot place a piece so that it is sandwiched between two enemy pieces. A single move may trap several enemy pieces in different directions. With more than one piece trapped, the player must use successive turns (while the opponent takes regular turns in between) rescuing the trapped pieces. If the Queen is trapped, the Queen must be rescued first, before any Guards. If a player creates a position where her six guards surround the centre space, without her Queen in the centre, the player loses. For an alternative start, with more variety, the players first take turns to place their pieces on any vacant spaces on the periphery, starting with the Queens. ■



Agon starting position.



Agon winning position.

David Ploog kindly submitted the following addendum, with some ideas about Agon:

According to the classification I presented in "Goals in Abstract Games," starting on page 8, Agon is a traversal game because to win you need to get all of your pieces to a goal zone. However, Agon differs from other traversal games such as Halma or Chinese Checkers in that both players share the same goal zone. This makes for tense matches of a unique nature. For example, the shared goal zone enforces a form of direct interaction which, in Agon, is given by relocation of pieces when they are trapped. Also, there is no Halma-style endgame where pieces of different colour cannot interact even indirectly. By the way, from the point of view of evolution of board games, it is interesting to observe that Agon's pincer traps are in direct line from the custodian capture of Greek Pettaia, Roman Latrunculi, and Norse Tafl games.

However, Agon is not just a ludo-historical or theoretical curiosity. It is a fun game in its own right, providing intriguing choices and is certainly worth exploring more deeply. Chapter 3 of the book Historic Board Games *by Damian Gareth Walker (2014) is devoted to Agon. After explaining the rules, he presents a collection of stratagems, including diagrams. Here, I just cite some of his hints.*

First, collective development of your pieces is often better than initial tempo gain. Do not blindly rush towards the centre! Second, try to keep your pieces together, both for offensive and defensive purposes. Do not trap your opponent's pieces only because you can! In the early stage, relocation might even benefit your opponent more than you. Instead, aim to set up chains of trappings where you can pincer piece after piece, with your opponent busy placing her trapped pieces on the boundary. Finally, especially later on, blocking becomes important! Try to impose roadblocks for your opponent by setting up "empty" pincers.

MeM

PatterN MatcheS

by Kerry Handscomb

David Pritchard, editor of iconic game magazine of the 1970's *Games & Puzzles* and writer of T*he Encyclopedia of Chess Variants*, introduced me to MeM in 2000. David wrote, "MeM is both a subtle and difficult game which requires great foresight to play well. It is also (a big bonus, in my opinion) visually and aesthetically pleasing." Subsequently, we printed David's article on MeM in *AG2,* even though I had not actually played the game myself, trusting in David's judgement. Nineteen years later, I constructed a MeM set, and started to investigate. MeM is unusual because of its beautiful goal.

The comments here are limited to the solitaire. We may return to MeM in a later issue, with an evaluation of the main game, which is for two players. Nevertheless, the solitaire game alone has compelling features, which illustrate the genius of the MeM design.

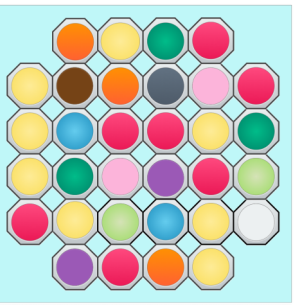
MeM was developed by Anatol W. Holt Hopfenberg, and first published in 1968 by Stelledar of Philadelphia. The name originates from the French *même,* meaning "the same," referring to the relationship between patterns of pieces. Das Spiel of Hamburg later republished the game as Imago in 1996, and then Kadon Enterprises reissued it as Imago Deluxe in 2002. According to Kadon, Hallmark also published a version in the 1980's, but there are no details. BoardGameGeek has a little more information, although coverage of MeM is scant.

Original copies of any version of MeM are difficult to find. Fortunately, the game is easy to construct, where the main difficulty is finding pieces in a large enough variety of quite distinct colours.

The MeM board is a 6x6 square grid, with the corners removed, consisting therefore of 32 spaces. You will need 32 pieces of eleven different colours, of a size to fit snugly into the board squares. The distribution of colours is as follows: 8, 7, 3, 3, 2, 2, 2, 2, 1, 1, and 1—meaning there are eight pieces of one colour, seven pieces of a second colour, and so on.

I designed a board and used commercial photo finishing to print the image on an aluminum panel. The glossy metal finishing has a nice, solid feel to it. Commercial MeM sets used glass beads. For my set, I decided to use buttons, because I could find buttons of the right size in eleven different colours. Unfortunately, buttons are typically used for clothes, not games, and tend mostly to be manufactured in drab colours—the resulting game set was unattractive, and the colours were insufficiently distinct. For the game to look good and be easily playable in imperfect light, I painted the plastic buttons with bright acrylics and finished them with varnish. The constructed set is shown in the image in the header of this article.

To start with, the 32 pieces are placed randomly on the 32 spaces. The diagram below shows a typical starting position.

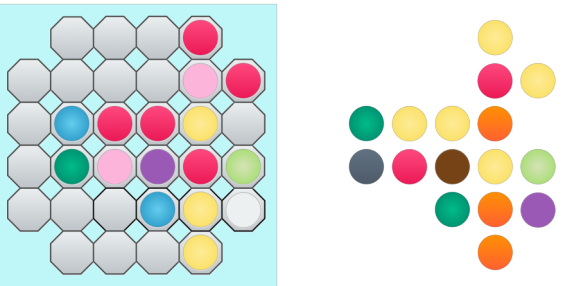


Typical MeM starting position.

The solitaire rules are simple. One by one, remove pieces from the board and place them in a play area close to the board. After the first piece, each piece removed must be placed in the space off the board orthogonally adjacent to a piece taken off previously. The key requirement is that the pattern of pieces off the board must continue to match at least one pattern of pieces still on the board.

The pattern-matching requirement is very clever. Firstly, the matching patterns must be identical in shape and orientation. Secondly, any two pieces in the pattern off the board are the same colour if and only if the corresponding two pieces in the matching pattern on the board are also the same colour. Particular colours do not need to match, only relationships between corresponding pairs of pieces, on the board and off the board, whether they have the same colour or not. We can think of the pattern-matching requirement as a *shape-colour isomorphism* between the pieces off the board and the pieces on the board. The goal will be easy to understand from the concrete examples below.

For the solitaire game, a winning position is reached when 16 pieces have been removed from the board in an isomorphic (i.e., matching) shape-colour pattern to the 16 pieces remaining on the board. The diagram below demonstrates an example of a won game, resulting from the position above:



You can see, in the final position, that the pattern of five red pieces on the board matches the pattern of the five yellow pieces off the

board; on the other hand, the pattern of the three yellow pieces remaining on the board matches the pattern of the three orange pieces off the board; two reds off the board correspond to two pinks on the board; and so on.

Incidentally, the board itself is not strictly necessary. All you need is to arrange the pieces initially into the 6x6 shape with the corners removed. This makes the game highly portable, where all that is required is a little bag of coloured buttons.

Initially, it seems tough to pick pieces to match patterns. And it is tough without a strategy to simplify the planning. The strategy involves thinking about the ways in which the group of pieces of any given colour can be split between the patterns on the board and off the board. For example, there are few ways the colour with eight pieces (in the diagrams, yellow) can be split between the two patterns. The largest conglomeration of the eight-piece colour must match a grouping of the seven-piece colour (in the diagrams, red) in the opposite pattern.

For example, a 4-4 split of the yellows is not possible. Each of the fours must correspond in its opposing pattern to four pieces of the same colour. These four pieces must be red, because otherwise the largest number of pieces with one colour is three. However, the seven red pieces cannot be split 4-4. Likewise, obviously, the yellows cannot be split 8-0. Therefore, the yellows can be split only in the ways 7-1, 6-2, or 5-3.

There are 22 combinations in which the pieces can be split between the colours, as shown in the list below. The first digit in a pair represents the number of pieces of that colour remaining on the board; the second digit represents the number of pieces of that colour off the board—or vice versa.

5-3, 2-5, 3-0, 1-2, 2-0, 0-2, 2-0, 0-2, 1-0, 0-1, 0-1
5-3, 2-5, 3-0, 1-2, 2-0, 0-2, 1-1, 1-1, 1-0, 0-1, 0-1
5-3, 2-5, 3-0, 1-2, 1-1, 1-1, 1-1, 1-1, 1-0, 0-1, 0-1
5-3, 2-5, 3-0, 2-1, 0-2, 0-2, 2-0, 0-2, 1-0, 1-0, 0-1
5-3, 2-5, 3-0, 2-1, 0-2, 0-2, 1-1, 1-1, 1-0, 1-0, 0-1
6-2, 1-6, 3-0, 0-3, 2-0, 2-0, 0-2, 1-1, 1-0, 0-1, 0-1
6-2, 1-6, 3-0, 0-3, 2-0, 1-1, 1-1, 1-1, 1-0, 0-1, 0-1
6-2, 1-6, 2-1, 1-2, 2-0, 2-0, 0-2, 1-1, 1-0, 0-1, 0-1
6-2, 1-6, 2-1, 1-2, 2-0, 1-1, 1-1, 1-1, 1-0, 0-1, 0-1
6-2, 1-6, 2-1, 2-1, 0-2, 0-2, 2-0, 1-1, 1-0, 1-0, 0-1
6-2, 1-6, 2-1, 2-1, 0-2, 1-1, 1-1, 1-1, 1-0, 1-0, 0-1
6-2, 1-6, 1-2, 1-2, 2-0, 2-0, 2-0, 1-1, 0-1, 0-1, 0-1
7-1, 0-7, 3-0, 0-3, 2-0, 0-2, 2-0, 0-2, 1-0, 1-0, 0-1
7-1, 0-7, 3-0, 0-3, 2-0, 0-2, 1-1, 1-1, 1-0, 1-0, 0-1
7-1, 0-7, 3-0, 0-3, 1-1, 1-1, 1-1, 1-1, 1-0, 1-0, 0-1
7-1, 0-7, 2-1, 1-2, 2-0, 0-2, 2-0, 0-2, 1-0, 0-1, 0-1
7-1, 0-7, 2-1, 1-2, 2-0, 0-2, 1-1, 1-1, 1-0, 1-0, 0-1
7-1, 0-7, 2-1, 1-2, 1-1, 1-1, 1-1, 1-1, 1-0, 1-0, 0-1
7-1, 0-7, 2-1, 2-1, 0-2, 0-2, 2-0, 0-2, 1-0, 1-0, 1-0
7-1, 0-7, 2-1, 2-1, 0-2, 0-2, 1-1, 1-1, 1-0, 1-0, 1-0
7-1, 0-7, 1-2, 1-2, 2-0, 2-0, 2-0, 0-2, 1-0, 0-1, 0-1
7-1, 0-7, 1-2, 1-2, 2-0, 2-0, 1-1, 1-1, 1-0, 0-1, 0-1

With this knowledge, the game becomes considerably easier. Almost every time the game can be won, by forming the matching patterns of 16 pieces on the board and 16 pieces off the board. You do not need to memorize the list, but note that it illustrates the type of thinking necessary to be successful. Bear in mind that the most common error, and path to failure, is where a piece that must stay on the board (for some pattern-matching necessity) becomes isolated from the main group of pieces—the final patterns on the board and off the board must be orthogonally connected.

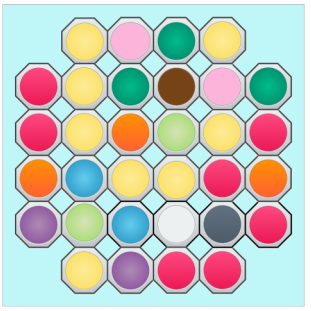
Thus, review the initial setup, looking for conglomerations of pieces. The final pattern on the board will have either five to seven yellow pieces or five to seven red pieces—these are the only possibilities. With six yellow pieces remaining on the board, for example, there must be six red pieces off the board to match them, and then the remaining two yellow pieces must be off the board, and the remaining red piece must be on the board. The collection of six yellow and one red piece on the board are best grouped close together, to reduce the possibility of isolating a piece. Once you have decided the overall strategy with respect to the yellow and red pieces, you can start removing pieces from the board that you know must come off. Then, you will need to decide how to split the two sets of three pieces. And so on.

I have said enough about strategy, and the rest will become obvious with a little practice. With concentration and care, you ought to be able to win every game.

Nevertheless, MeM remains enjoyable even though you know you can win every game. The type of thinking required is in itself pleasurable, a mental exercise like that of solving cryptic crossword puzzles—the experienced solver can almost always solve the puzzle! Likewise, some people continue to play with a Rubik's Cube, even when they know how to solve it every time. Moreover, the relationship between the two final patterns is inherently pleasing. The connection between the two patterns preserves shape and the colour-identity relationships, but not individual colour relationships: a shape-colour isomorphism. According to Pritchard, Alex Randolph, inventor of Twixt, among other classic abstracts, including Universe, considered "MeM to be the very best abstract game in the world."

The discussion refers not to the two-player game, but the solitaire alone. Nevertheless, the key concept relating patterns of pieces is present throughout all versions of MeM, and it is this concept, which defines the brilliant goal.

You may enjoy playing around with buttons, as I have described, with no further amendments to the game. Nevertheless, there are ways to make MeM solitaire continually challenging. Usually, a MeM starting position will offer multiple possible complete solutions. Let us decide that the more compact solutions are more desirable, where the compactness of a solution is measured by the smallest rectangle in which the completed pattern fits. The score is the total of the length and width of this rectangle. The lower the score, the better. Consider the following starting position:

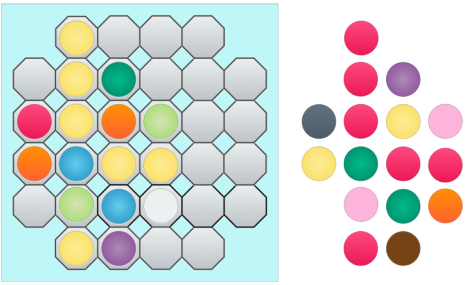


MeM opening position with multiple solutions.

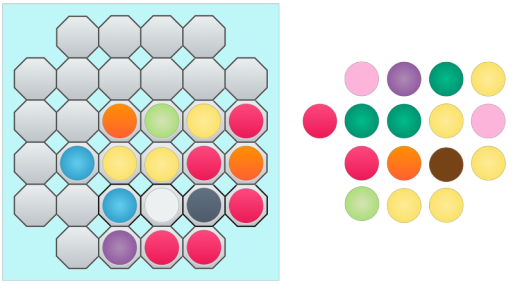
"That play of black upon white, white upon black, has the intent and takes the form of creative art. It has in it a flow of the spirit and a harmony of music. Everything is lost when suddenly a false note is struck, or one party in a duet suddenly launches forth on an eccentric flight of his own. A masterpiece of a game can be ruined by insensitivity to the feelings of an adversary."

~ from The Master of Go *by Yasnari Kawabata*

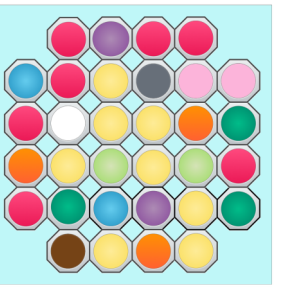
Here is one solution, with score 10:



Here is another solution, with score 9:



The perfect solution, would involve two 4x4 patterns, with score 8. A perfect solution is not always possible, but 9 is a good score to aim for. Here is a puzzle, to construct a perfect solution. The solution is unique in terms of which16 pieces remain on the board, but inevitably singletons and pairs may be switched in the pattern off the board.



MeM opening position with a perfect solution.

The solution is on the inside front cover.

MeM has a lovely objective with plenty of aesthetic appeal. The solitaire works perfectly as an intellectual exercise. Create balance and harmony! ■

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* = **complete rules**
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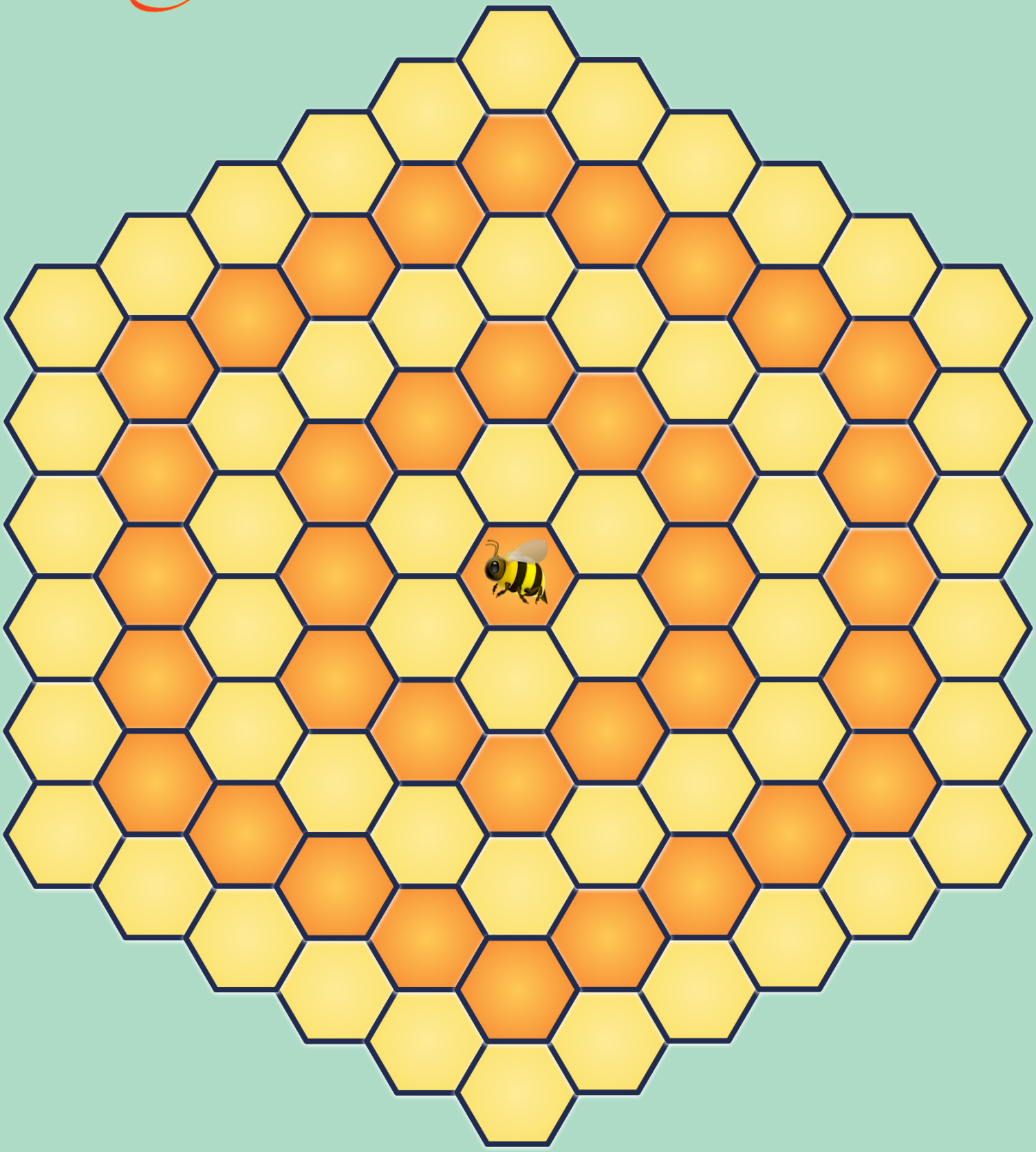
Agon: The Queen's Guard